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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

SEPTEMBER 1948 • VOLUME 37 • NUMBER 3

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ANNUAL MEETING
A. D. A.
SEPTEMBER 13-17, 1948

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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

SEPTEMBER 1948 • VOLUME 37 • NUMBER 3

FORECASTING THE SUCCESS OF FRESHMAN DENTAL STUDENTS THROUGH THE APTITUDE TESTING PROGRAM

Shailer Peterson, Ph.D., Chicago

PREVIOUS articles[1-6] in THE JOURNAL have described in some detail the origin of this program, its objectives and the manner in which it was to be conducted. The program began with the testing of the 1946-47 freshmen as they entered dental school and data have now been gathered on two groups of freshmen. Two primary objectives of the program were: (1) an evaluation of the students entering the study of dentistry and (2) the selection and preparation of a testing program which will predict a student's probable success in the study of dentistry. This article will report some of the findings of the program by comparing the two freshman classes that have been tested and by describing the ability of the tests to predict the success of these freshmen in their first year of dental school.

Comparison.—As reported in THE JOURNAL[6] the 1946-47 freshman class earned very high scores on the battery of tests given to them at the time of entrance. In some instances, it was possible to compare the achievement of the dental freshmen with other groups to whom the tests had been given and in this way obtain a relative measure of the dental student's ability in certain skills. Some of the tests given to the 1946-47 dental freshmen were repeated in the battery given to the 1947-48 dental freshmen, thereby allowing a comparison to be made between the two classes. In general, it can be said that the 1947-48 freshman class is slightly superior to the 1946-47 group. Table 1 describes the relative ability of these two classes.

From Table 1, it is evident that the quality of students entering dental school is very high. If two groups are identical, the average student in one group equals or exceeds in ability 50 per cent of the students in the other group.

Director of Educational Measurements, Council on Dental Education, American Dental Association.

1. Measuring the Dental Student: I. *J.A.D.A.* 32:752 (June) 1945.
2. Who Should Enter Dental School? *J.A.D.A.* 33:58 (January) 1946.
3. Measuring the Dental Student: II. *J.A.D.A.* 33:633 (May) 1946.
4. Aptitude Testing of Dental Students. Editorial. *J.A.D.A.* 35:197 (August 1) 1947.
5. Dental Aptitude Testing Program: A Report of Progress. *J.A.D.A.* 35:175 (August 1) 1947.
6. The Achievement of Freshman Dental Students on the 1946-47 Aptitude Testing Program. *J.A.D.A.* 35:868 (December 15) 1947.

In the case of the intelligence test, for example, the average dental student, equals or exceeds 74 to 84 per cent of the two comparison groups showing that the dental freshmen are considerably superior to the freshmen in four-year colleges and universities. Even though the groups with which the dental freshmen have been compared in Table 1 do not have backgrounds identical with those of the dental freshmen, still all these data support the conclusion that the dental students comprise a very capable, highly skilled group. It is true that they do less well in the English test, but in this instance they are being compared with students who have just completed a year of English.

Prediction.—Charts have been prepared and correlations computed to determine to what degree the test scores predict success in dental school. Success in dental school includes success in the technic, or preclinical subjects, as well as in the theory subjects. In the first year of testing, it has been found that:

1. Scores on the intelligence, reading, English, word dexterity and science vocabulary tests can predict the freshman dental student's grades in theory courses.

2. Scores on the visualization and carving tests can predict the freshman dental student's grades in technic courses.

The data showed great variations between schools as regards correlation between aptitude test scores and grades in dental school. This is understandable and to be expected. In those schools reporting grades ranging from D's and Failures through B's and A's, it was pos-

Table 1.—A comparison of the 1946-47 and 1947-48 dental freshmen with national norms available on certain tests

Test	1946-47 freshmen	1947-48 freshmen
General intelligence	Average freshman equals or exceeds in ability 74% of the freshmen entering 4-year colleges before World War II, and about 80% of the freshmen now entering 4-year colleges.	Average freshman is even better than 1946-47 dental freshman. He equals or exceeds 78% and 84% of the 4-year college freshman groups.
Reading comprehension in the natural sciences	Average freshman equals or exceeds in ability 78% of the freshmen and sophomores just completing certain science courses.	Average freshman is very much better than the average 1946-47 dental freshman.
Correctness and effectiveness of expression	Average freshman equals or exceeds in ability 39% of the freshmen and sophomores who have just completed a freshman English course.	Average freshman earns lower score than the average 1946-47 dental freshman.
Survey of object visualization	Average freshman equals or exceeds in ability 79% of the men and women from various occupations who have taken this test.	Average freshman is very much better than the average 1946-47 dental freshman.
Carving dexterity	No comparison possible with non-dental groups. Wide range of abilities demonstrated.	New test given each year and exact comparisons impossible; 1947-48 group appears to be slightly superior.

sible to show that the tests could accurately predict performance, whereas in those schools in which nearly all of the students earned the same grade it was impossible to demonstrate much, if any, prediction.

Table 2 illustrates the correlations found in one school where the performance grades of the students varied from C minus to A minus in the theory courses and from D to A minus in the technic or preclinical courses. There are other schools having higher correlations than those reported in Table 2, but this school had relatively high correlations in all course or test areas. The correlation figures should be interpreted with the following things in mind:

1. Correlations range from .00, indicating an absence of any relation, to plus 1.00, indicating a perfect relation between the two factors or items.

2. Correlations of .00 to .20 are too low to be of any use in forecasting one performance on the basis of another.

3. Correlations of plus .30 to plus .45 constitute the range found in most aptitude testing studies and while these are not high correlations in themselves, when several factors having such correlations are combined, useful forecasting can be accomplished.

4. Correlations of plus .45 to plus .60 indicate a high degree of relationship and when several items having such correlations are combined, very accurate forecasting can result.

If two tests, each of which measures different traits or skills, have correlations of plus .45 with the grades earned by students, one could predict a student's grades with equal accuracy by use of either of the tests. However, by using the student's scores on both tests, his grades can be forecast with considerably greater accuracy. That is true of the tests given to the dental freshmen. One can predict with some accuracy the student's success in his theory courses by using the intelligence test scores, reading test scores or English test scores, but the accuracy of forecasting his grades will be improved considerably by employing all three of these tests.

Table 2.—Correlations between aptitude test scores and freshman grades in one dental school

Tests and predental grades	Correlation with: Theory grades	Technic grades
Predental grades	**+.26**	+.21
Quantitative intelligence	**+.53**	+.23
Linguistic intelligence	**+.56**	+.10
Total intelligence	**+.63**	+.27
Reading in science	**+.55**	+.22
English comprehension	**+.60**	+.13
Word dexterity	**+.42**	+.09
Science vocabulary	**+.58**	+.28
Object visualization	+.19	**+.44**
Carving dexterity	+.17	**+.41**

In Table 2 the figures in boldface type indicate the correlations between (1) theory course grades and academic-type tests, and (2) technic course grades and manual- and visual-ability tests. In all instances, it was evident that the academic-type tests were useful for predicting success or failure in the theory courses although they were of little value in predicting grades in the technic courses. On the other hand, the visualization and manual-ability tests were useful for predicting success or failure in the technic courses but were of little use in predicting performance in the theory courses.

The correlations which have been obtained are as high as could possibly be expected. In fact, the correlations in Table 2 are considerably higher than those usually found in prediction studies in which the students have been carefully selected from a large number of applicants.

Reports from the schools indicate that nearly all of them have found the test

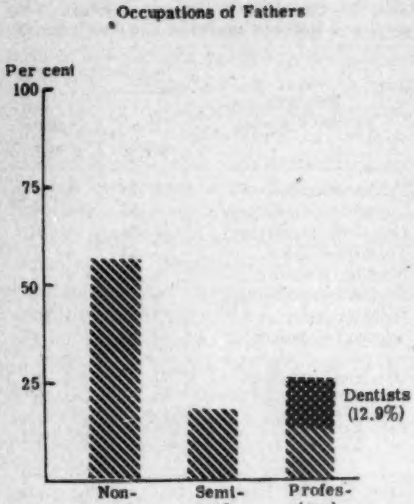


Figure 1

scores to be useful. As the tests were given after the students had been admitted, it has of course been impossible for the schools to employ the test data for admission purposes. Many schools have compared the results of the tests with the records made by the students and report that the test scores would have enabled them to avoid selecting a large proportion of their poor and failing students. Most of the schools have found the test data useful in counseling the students. Faculty meetings have been conducted to study the test findings, with the result that instructors have become more familiar with the potential ability of their students. Other faculty meetings have considered the test data when discussing methods of grading, objectives of courses, and importance of various requirements. A roundtable discussion was conducted at the recent meeting of the American Association of Dental Schools in Buffalo. At this discussion, representatives from the schools told about their use of the test results and about the agreement they were finding between test scores and student performance. It was evident that, already, the data collected through the aptitude testing program are being used in a great many ways.

From Table 2, it is apparent that the predental grades of students do not furnish as good a means of predicting success in dental school as do the aptitude test scores. There are several reasons for this but the principal one is that predental grades come from many different schools as well as from many departments within each of the schools. These grades, therefore, represent many different levels of standards and this necessarily detracts from the accuracy of the over-all estimate of a student's ability. Test scores have the advantage of supplying a measure of the student's ability with everyone being measured on the same yardstick. It is for that reason that the aptitude test scores consistently give higher correla-

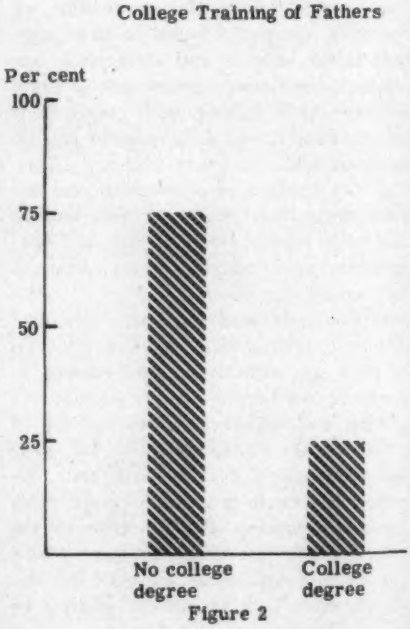
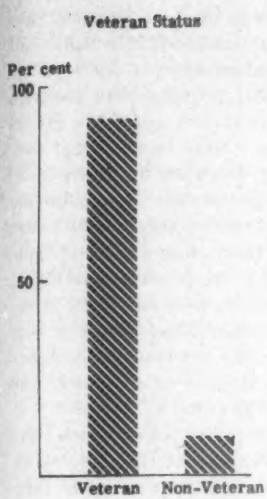


Figure 2



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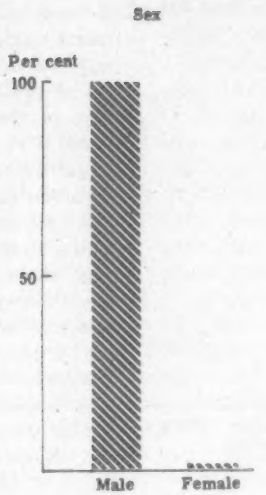


Figure 4

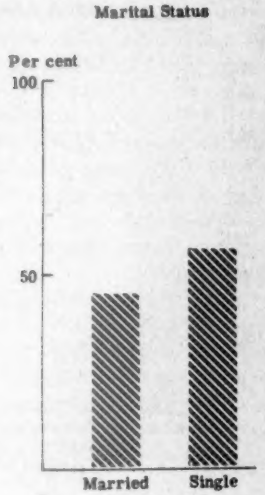


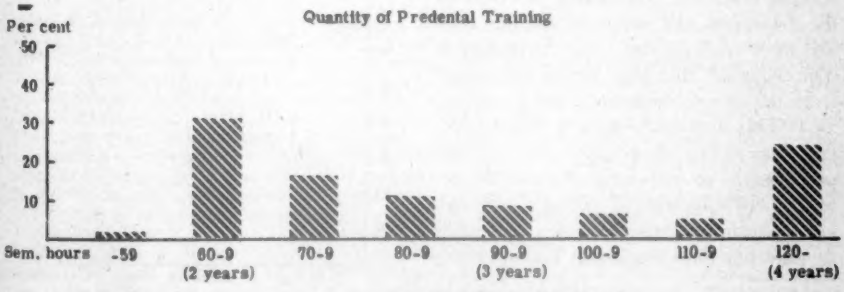
Figure 5

tions with performance than do the predental grades.

The predental grades now furnish the admission committees with some measure of the student's previous success in college and university work. Table 2 shows that although the predental grades have a positive correlation, they are far from constituting a reliable and accurate basis for prediction. When the aptitude test scores can be made available to the admissions committees, the schools will have fewer student failures due to low scholastic ability.

Personnel Data.—In addition to administering tests and collecting test scores on all of the entering students, information also has been assembled on the age, marital and veteran status, occupation of father and a number of other items.

Figure 1 shows that 13 per cent of the students now entering dental school are the sons of dentists. Also, 26 per cent of the freshmen come from homes where the father is engaged in professional occupation and 17 per cent from homes where the father is engaged in an occupation classified by the Occupational



(1 year = approximately 30 semester hours)
Figure 6

Degree of Students at Time of Entering Dental School

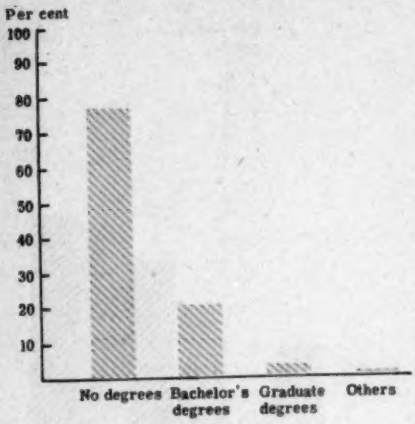


Figure 7

Classification Committee[7] as semi-professional. This semi-professional group includes bankers, photographers, and technicians.

Figure 2 describes the college and university status of the fathers of the students entering dental study. It shows that 25 per cent of the fathers have earned a college or university degree, nearly two-fifths of which are dental degrees. Of the 75 per cent who do not have degrees, many have earned college or university credits but not enough to give them a formal degree.

Figures 3, 4 and 5 describe the veteran status, sex and marital status of the incoming students. Ninety-one per cent of the freshmen are veterans, 99 per cent are male and 44 per cent are married. The ages of the new freshmen varied from 18 to 45, with an average age of 25.1. This average is slightly lower than last year when there was also a large percentage of veterans. Figure 6 describes the quantity of college and university training these freshmen had prior to entering dental school. Twenty-three per cent had four or more years of predental training and less than a third had only the minimum of two years of required predental training. Not only do most of the freshmen come to dental school with more than two years of predental training, but they also have good predental college records. Nearly 90 per cent have grade-point averages of better than a C, and more than a third of them have an average of B or better. Fig. 7 shows that while 77 per cent of the freshmen have entered with no college or university degrees, 20 per cent have earned baccalaureate degrees and 3 per cent have graduate degrees.

The students were asked when they had chosen dentistry as their life work. Figure 8 shows that 33 per cent of them had made the decision in high school, 35 per cent during college or university and 7 per cent since college. About a fourth of the freshmen were not sure when the decision had been reached. Nearly a fourth of the freshmen have some hobby that uses their hands and 13 per cent have drawing or applied music as a hobby. A third give the active sports such as hunting and fishing as their hob-

Time of Decision to Enter Dentistry

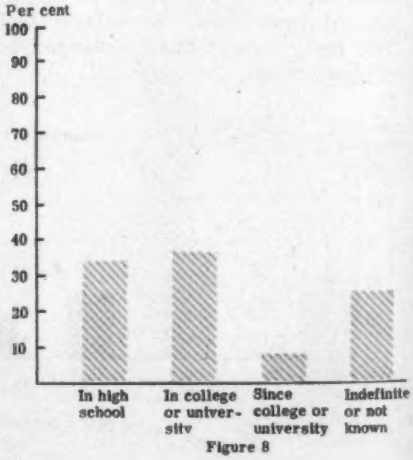


Figure 8

7. *Convertibility List of Occupations* prepared by the Joint Committee on Occupational Classification, sponsored by the Central Statistical Board and American Statistical Association.

bies. Moreover, most of the freshmen feel that their hobbies and activities prior to entering dental school have helped them develop their manual skill to a fairly high degree.

Conclusion.—The aptitude testing program is collecting data which are proving that the performance of students in dental school can be predicted with a high degree of accuracy. All of the dental schools accredited by the Association give the battery of test to their entering students and report the progress and achievement of all students so that comparisons can be made between test scores and dental school achievement. Many of the schools are finding that the test data and other information gathered by the program are valuable now in the counseling of students and as a basis for many of the topics considered at faculty meetings.

The data collected prove that the students preparing for dentistry are a highly select and capable group. All of the freshmen have high scholastic records from their college and university work and many earn degrees before entering dental school.

The schools are using all data now at their disposal for the selection of capable students and are looking to the time when aptitude tests can be given to all applicants. These tests will supply the information needed to improve the accuracy with which the dental student's success in school can be forecast.

Dental Health and Mental Disorders.—Authorities are not agreed as to the effect on mental health of dental sepsis or impacted teeth. G. C. Anderson wrote in 1942 that numerous neurologic psychiatric states have sometimes been related to teeth. Meningitis, encephalitis, myelitis, brain abscess, herpes zoster, anterior poliomyelitis, multiple sclerosis, neuritides, convulsions, dysphasia, hysteria and occasional neuroses and psychoses. T. C. Graves, chief medical officer, City of Birmingham Mental Hospital, in an article in the *British Dental Journal* in January and February, 1942, seeks to prove, giving facts and figures and illustrative cases, that removal of mouth sepsis, impacted wisdom teeth and associated nasopharyngeal infection has resulted in great improvement, if not cure, after all other treatments have failed, in a variety of mental states. He strongly advocates X-raying the teeth and jaws of all patients and removing all possible causes of sepsis and pressure. Other authorities are equally emphatic that dental infection and impacted teeth have little or nothing to do with such cases. It seems, however, that one is on safe ground in recommending in all mental cases X-rays of both jaws and then the elimination of all dental and associated sepsis and, in my opinion, any impacted wisdom teeth. Apart from the effect of this on the mental state, the removal of infection will perhaps take away an overwhelming load from the antitoxic forces in the body, improving the general health in the process.—*Gerald Jack, "The Third Molar," M. Press 219:501, June 9, 1948.*

THE PUBLIC HEALTH SERVICE HAS AN ANNIVERSARY

Bruce D. Forsyth, D.D.S., Washington, D.C.

ONE hundred and fifty years ago, on July 16, 1798, President John Adams, by signing an "Act for the Relief of Sick and Disabled Seamen," brought into being the federal health agency now known as the Public Health Service of the Federal Security Agency.

The dental profession joins with all allied professions in marking this anniversary because, in recent years particularly, dentists have played a significant role in the Agency's development. The American Dental Association and the Public Health Service have been partners in numerous programs that have advanced the profession and given the American people improved opportunities to attain dental health.

The story of this national health agency is typical of the way in which governmental programs change to meet the changing needs of the people.

Early Development

The congressmen who passed the act in 1798 intended merely to set up a system of taxation that would relieve coastal communities of the expense of caring for sick and injured seamen. Their original law provided that marine hospital directors be appointed by the President in the principal ports; that these directors furnish treatment to seamen; that hospitals be bought or erected, if advisable, and that the plan be financed by a deduction of 20 cents a month from each seaman's wage.

Collections from seamen began on September 1, 1798, and by the following year sufficient funds had accumulated to finance hospital service in barracks near Boston. By 1800 the government was able to buy a hospital in Norfolk, and in 1803 it erected a hospital in Boston. These were the first of what is now a network of 24 marine hospitals, 17 dispensaries, and almost 100 medical relief stations, serving every section of the United States and its territories. This network cares not only for merchant seamen but for Coast Guardsmen and other groups subsequently designated by Congress as beneficiaries. The special taxation system was abandoned in 1905. Ever since then, the Service has been financed from government tax funds.

For eighty years the operation of marine hospitals was the only health responsibility assumed by the federal government's major health agency. No dental care was included. Although Pierre Fauchard's treatise on dental art, which appeared in 1728, is generally credited with raising dentistry from the status of a handicraft, the recognition of dentistry as a profession was long in developing, and its inclusion in the field of public health activities was delayed even longer. The fact that the United States was attaining world leadership in dentistry—establishing the first national dental society in 1839 and the world's first dental school in 1840—did not influence marine hospital services. When a merchant seaman had dental trouble, he had to find his own dentist and pay his own bill. Not until 1919 was dental care made an in-

Assistant Surgeon General and Chief of the Division of Dentistry, Public Health Service, Federal Security Agency.

tegral part of the health services furnished by the marine hospital system.

The first radical departure from the purpose of the original law occurred in 1878, when the Marine Hospital Service, as the agency was then called, was asked to administer the first national quarantine law. With this new function, its services were no longer limited to one occupational group. It became responsible for protecting every American against imported diseases. Federal quarantine powers at first, however, were extremely limited and functioned only when state laws proved inadequate.

The Service Branches Out

With increasing knowledge of the nature of communicable diseases came public awareness of the desirability of stronger national, and later international, quarantine controls. Today there are Public Health Service quarantine stations at all airports that receive foreign planes, at all seaports, and along the Mexican border. Quarantine officers are also stationed abroad to prevent aliens from embarking for this country when they have certain communicable diseases or any physical or mental defects that might cause them to become public charges.

Although the connection at first seems remote, the development of the federal quarantine program has had a direct effect on the advancement of the dental profession in this country. The connecting link is research. The need to know more about exotic diseases led the federal government into the field of medical research. A Hygienic Laboratory, ancestor of the Agency's present National Institute of Health, was established in 1902, the year in which the name of the Service was changed to "Public Health and Marine Hospital Service." ("Marine Hospital" was dropped from the title in 1912.)

Under its broad authority to investigate "the causes, diagnosis, treatment, control and prevention of the physical and mental diseases and impairments of man," the Public Health Service has become the nation's heaviest investor in dental research. In addition to extensive research conducted by its own dentists, it is currently financing more than a hundred thousand dollars' worth of dental research in nonfederal institutions. These projects are reviewed and passed upon by an advisory council that includes prominent denfists from all parts of the country. The wide range of studies is indicated by a random listing of a few of the projects' titles:

Anaerobic Mixed Infections
Solubility Changes in Tooth Enamel
Relationships of Oral Bacteria
Effect of Maternal Nutrition on Bones and Teeth
Enzyme Inhibitors of Dental Caries
Gingival Histopathology
Dental Restorations and Supporting Tissues

Some of the work leading to the discovery that sodium fluoride solution can reduce decay in children's teeth was done by the research arm of the Public Health Service. Much of it, however, was done in cooperation with dental societies and state and local health departments and typifies the most recent and comprehensive of the public health programs that make up present-day Public Health Service.

The Social Security Factor

The federal government's authority to undertake such programs stems from the Social Security Act passed in 1935. This act authorized grants-in-aid to states for general health services, including dental health. Under the stimulus of this legislation, dental hygiene programs, particularly for children, began to flourish. At the time the Social Security Act was passed, only fifteen states had any type of dental hygiene program and only eight had full time dental health administrators in their health departments. Five

years later, thirty-eight states had programs and were employing a hundred and fifty-four full time dentists. Today, forty-four states have organizational provisions for conducting dental health programs.

With state, community and school programs already organized, it was relatively easy for dentists to test topical fluoride applications on a sufficient number of children, and with sufficient controls, to obtain conclusive proof that a series of four applications of 2 per cent aqueous solution could produce approximately a 40 per cent reduction in the incidence of caries.

Important as the fluoride demonstrations have been, the pattern under which they were conducted is perhaps even more significant because it has made possible the expansion of many other health programs. It was through this same demonstration technic that mass roentgenographic surveys were established as a practical method of discovering tuberculosis in its early and most responsive stages. Currently, through mass population surveys, the demonstration method is being employed to find practical means of diagnosing early heart disease and early diabetes.

Although some demonstration work of this kind antedates the state grants-in-aid program authorized by the Social Security Act, this legislation has been a stimulating factor; it has promoted closer cooperation between the federal health agency and all state and local groups concerned with health. As they are financial partners in developing state and local health services, it was only natural that these groups should become working partners in making these services increasingly effective.

Advances directly attributable to the grants-in-aid program include general health grants to states, which partially support the local health departments of many communities; special grants for tuberculosis, venereal disease, industrial hygiene, mental hygiene and cancer, and the hospital survey and construction program, which authorizes federal funds to finance a third of the cost of a five-year construction program to bring hospitals and health centers to the areas that need them most. The total cost of this program is estimated at $1,250,000,000.

Dental Services

Individually and through their professional organizations, dentists have helped to channel federal demonstration and grants-in-aid funds into projects for improving the nation's dental health. Besides participating in the fluoride demonstrations, they are currently supporting demonstrations to determine more effective uses of auxiliary personnel, to improve school dental hygiene programs and to promote the detection, by dentists, of early oral cancer. As members of boards of health and Public Health Service advisory councils, and as employees of state and local health departments, dentists are helping to guide many of the grants-in-aid programs. Dentists have also been influential in having plans for new dental health facilities included in the Hospital Survey and Construction Program.

Within the Public Health Service itself there are now approximately two hundred dentists. Together with physicians, nurses, engineers, scientists and other specialists, they form the Commissioned Corps of the Service, which parallels in organization, rank and pay the personnel framework of the Army and Navy. Dentists were first directly employed in 1919, when the Public Health Service was made responsible for the care of all veterans of World War I. Congress authorized the inclusion of dental as well as medical service, and by 1922, when the organization of the Veterans Bureau relieved the Public Health Service of its responsibilities in this direction, dental service had become an

established part of the marine hospital system. The majority of the dentists employed by the Agency today are engaged in actual clinical practice, either in the marine hospitals or in Public Health dispensaries. Private dentists, paid on a fee-for-service schedule, serve beneficiaries to whom neither a marine hospital nor a dispensary is accessible.

In addition, the Service provides mobile dental trailer units to care for personnel in isolated Coast Guard stations. Special provisions are made for special needs. For example, when the Alaska-Canadian highway was being constructed the Public Health Service arranged for dental officers and equipment to be flown to remote encampments to serve Army and civilian personnel.

During World War II, when the Commissioned Corps of the Public Health Service was made a part of the military forces of the United States, dental officers were assigned not only to fighting transports but also to transports carrying personnel and cargo. While in battle, they assisted the medical officer in the care and treatment of casualties. In addition, dental assignments to Coast Guard stations and ships were extended to serve the increased number of officers and enlisted men.

The Present Program

Standards, policies and professional supervision of all Public Health Service dentistry are handled by the Division of Dentistry. This division was established in 1944 and is directed by an assistant Surgeon General, who holds a rank equivalent to that of a rear admiral in the Navy.

Seven of the dentists attached to the States Relations Division are assigned as dental consultants to district offices of the Public Health Service. Together with other dentists assigned to special projects, they work with state and local health departments, voluntary groups and professional societies in the development of dental health programs in schools, health departments and communities and in the demonstration of new technics applicable to such programs.

The dental research staff in the laboratories of the National Institute of Health includes eight full time dentists. They cooperate with specialists in other fields in investigating the cause and cure of major dental diseases.

The first dental research work undertaken by the Service was done in 1931, when it spent $2,500 in studying fluorides as a cause of mottled enamel. Since that time the research program has expanded greatly. For the past eight years the American Dental Association and other interested groups and individual persons have sponsored legislation to establish a dental health institute in the Public Health Service and to provide for research grants-in-aid to dental schools and other nonfederal institutions. This year their efforts were rewarded when Congress passed a bill which authorized to be appropriated a sum not to exceed two million dollars for the construction and equipment of a dental research building and $750,000 annually for research purposes.[1, 2]

The dental section of the Industrial Hygiene Division, Bureau of State Services, cooperates with the medical, engineering, chemical and statistical sections of this division in providing consultation on the oral health of industrial populations.

In 1929 the first investigation of an occupational condition with oral manifestations was made among painters of radium dials. Between that time and 1942, several other surveys were made. The Industrial Hygiene Division became concerned with the oral health of the industrial employee as it affected or was

1. Dental Research Bill Passed by Both Branches of Congress. *J.A.D.A.* 37:50 (July) 1948.

2. Dental Research Bill Passed by Congress; Sent to President Truman for Signature. *J.A.D.A.* 37:80 (July) 1948.

affected by his general health and his working environment, and in 1942 a dental section was developed for organizing this work in the states. These investigative activities, it is anticipated, will expand with the establishment in 1948 of an investigations laboratory. This activity will be a part of the industrial hygiene research program. Problems concerning oral health of industrial workers are too numerous to describe in this article, but they are highly significant and will be solved only after much field observation and laboratory work is accomplished.

The dental section of the Federal Employee Health Division is charged with the responsibility of establishing a preventive type of health program, including dental services, for federal employees as enacted in Public Law 658 by the Seventy-ninth Congress. Under the provisions of the law, heads of departments and agencies of the federal government may establish employee health programs after consulting with the Public Health Service and considering its recommendations.

Major objectives of the program are (1) to promote and maintain the employee's optimal dental health, (2) to increase the employee's efficiency and productivity on the job and (3) to reduce absenteeism due to illness, employee turnover and compensation cases. Achievement of these goals involves program planning, the development of standards, and determination of the scope and type of dental health service needed by federal employees throughout the United States and its possessions.

This review of the development of the Public Health Service omits many historic features, such as the establishment of its special institutions for victims of leprosy, for drug addicts, and for mentally disturbed and tuberculosis patients; its work in federal prisons; its service to Indians and Eskimos; the development of its facilities for sanitation and abatement of pollution, and its participation in international health programs. However, even without such details it should be apparent that the Agency has undergone drastic changes from its beginning as a tax program of the Treasury Department to its present position as the health branch of the Federal Security Agency, concerned with every aspect of national health. All these changes took place gradually and have been closely geared to the expressed needs and wishes of the people; this Agency, therefore, is perhaps as good an illustration as could be found of the evolution of government through the democratic process.

Man's Basic Needs. —If local government changes, the fundamental needs of man do not change. Pure food, shelter, fresh air, security against overwhelming infection, balanced activity and rest, social contacts and mental adjustment. Each age-period in life has its own needs as it has special characteristics, but the requirements vary in degree rather than in fundamentals. It is obvious that local authority can contribute to the maintenance of these essentials to health.—*"Local Authority and Local Health," M. Press 219:385, May 5, 1948.*

ACUTE NECROTIZING PERIODONTAL DISEASE: AN APPRAISAL OF THERAPY AND A CRITICAL CRITERION

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It is now thirty years since the dental profession was confronted with acute necrotizing periodontal disease as a major health problem from the standpoint of incidence and wide distribution among the population, both military and civilian. The American soldier of World War I named the disease "trench mouth." It previously had been designated by the eponyms "Vincent's infection" and "Plaut's angina." The modern trend in nomenclature to name diseases by accurately descriptive designations has led to the development of more acceptable and useful terms.

Accordingly, the disease group entity under discussion in this report will be designated as "necrotizing periodontal disease." Included in this group are a wide range of involvements, differentiated on several principles of disease classification. On the basis of tissues involved, there are three classifications: necrotizing gingivitis, necrotizing periodontitis and necrotizing stomatitis. On the basis of disease intensity, there are also three classifications: acute, subacute and chronic. The logic for designating these oral diseases as periodontal is to be found in the fact that they always arise primarily in gingival sulci or under gingival flaps that are associated with partially erupted teeth.

These designations do not take into account differences in causation. These differences in causation may serve as still another basis for classification. Some cases of necrotizing periodontal disease undoubtedly occur secondary to important systemic diseases, such as agranulocytosis. In these cases, locally acting etiologic factors, although necessary for the development of the disease, play roles of secondary importance to the systemically acting factors. In other cases, the reverse is no doubt true. Until such time as our knowledge of causation in this field is more extensive, further differentiations on this basis appear unwarranted.

It is not the purpose of this report to present a comprehensive discussion of all aspects of this health problem or to review the extensive literature on the subject. This has been done by many contributors to the periodical literature and by the authors of recently published textbooks on dental diseases and their treatment. This discussion will concern itself with an appraisal of the therapy of acute necrotizing periodontal disease, with special reference to the criteria used in judging the merits of its therapy. It is indeed a sad commentary that the profession still finds itself without general agreement as to the merits of the numerous treatment methods proposed. It might be interesting to speculate on the causes of this quandary.

Our incomplete knowledge of causation has, of course, led to many empiric practices in connection with this problem. Without intending to discuss the etiology of necrotizing periodontal dis-

Medical College of Virginia.

case, it is nevertheless important to note that the old fusospirillary concept of its causation is now outmoded in light of our newer and more extensive knowledge in this field. It now appears to be definitely established that at least four organisms play exciting bacterial roles in the causation of necrotizing periodontal disease. Smith,[1] Proske and Sayers[2] and Rosebury[3] have reported extensively on this subject. These workers are in general agreement that the exciting bacterial complex includes a vibrio (Vibrio viridans) and an anaerobic streptococcus in addition to a spirochete (Treponema microdentium or Treponema mucosum) and one of several varieties of fusiform bacillus. More than this, there is much evidence to indicate that the present primary emphasis placed on the bacterial phase of this disease entity in connection with its treatment is unwarranted. This is borne out by certain experiences in therapy to be discussed later. These experiences appear to outmode all therapeutic practices based on the use of drugs as antibacterial agents.

Clinical Evidence

Another reason for the chaos prevailing with regard to the therapy of acute necrotizing periodontal disease is the unwillingness, the inability or the lack of knowledge required to evaluate properly the therapeutic results. Much of such an evaluation rests on clinical evidence, a type of evidence that is difficult to appraise objectively. The reasons for this difficulty should be clearly understood. It devolves on several principles in pathology. No disease process ever remains constantly fixed. It is, furthermore, impossible to forecast accurately the exact course which a given disease process, especially an acute one, will take hour by hour or day by day. Most important is the axiom that all nonfatal, acute, infectious, inflammatory processes resolve themselves, in due time, completely or to a state of chronicity.

These facts have very important relations to the problem of the therapy of necrotizing periodontal disease, particularly the acute form with which this report is concerned. In simple terms, the application of these principles to the problem under discussion means simply this: the fact that a patient with acute necrotizing periodontal disease is subjected to a remedy which may be followed by a subsidence of acute symptoms is not proof that the applied remedy has merit and contributed to the patient's improved or more comfortable status. One cannot determine from such a recitation that the remedy has any merit whatsoever. Before this can be established several other facts must be ascertained to prove that the remedy altered the natural course of the acute disease. Another consideration to bear in mind is that when several remedies are applied simultaneously in the treatment of a disease neither remedy may be termed meritorious unless it first has been compared singly with an established control.

The abuse of these principles by those who present the clinical report type of testimonial in support of various remedies is such as to disgust critical students of the subject. Yet, the truth is that most of the reports in the literature dealing with therapy of acute necrotizing periodontal disease are testimonial in type and are based on clinical observations without controls and without due consideration of the natural course of the disease treated. This renders them not only worthless but also contributory to the prevailing confusion and chaos in this field of health service.

Most of the testimonial clinical reports on the treatment of acute necrotizing pe-

1. Smith, D. T., Fusospirochetal Disease of Lungs Produced with Cultures from Vincent's Angina. *J. Infect. Dis.* 46:303 (April) 1930.
2. Proske, H. O., and Sayers, R. R., Pulmonary Infection in Pneumoconiosis; Fusospirochaetal Infection. Experiments in Guinea Pigs. *Pub. Health Rep.* 49:1212 (October 12) 1934.
3. Rosebury, Theodor, The Etiology of Vincent's Infection, in Gordon, S. M., *Dental Science and Dental Art*. Philadelphia: Lea & Febiger, 1938, p. 415.

riodontal disease deal with the use of drugs. A partial list will suffice to indicate the wide variety of these remedies, each of which has had ardent proponents: chromic acid, hydrochloric acid, trichloracetic acid, tannic acid, silver nitrate, zinc chloride, copper sulfate, sodium perborate, hydrogen peroxide, potassium permanganate, Dakin's solution, aromatic Chlorazene, Lugol's solution, tincture of iodine, U. S. P., Churchill's iodine, Talbot's iodine, methylene blue, acriviolet, acriflavine, mercurochrome, brilliant green, royal purple, gentian violet, tincture of metaphen, mercuric chloride, Merthiolate, bismuth sodium tartrate, potassium bismuth tartrate, Fowler's solution, arsphenamine, neoarsphenamine, sulfarsphenamine, hexylresorcinol, sodium ricinoleate, sodium carbonate, silver protein, sulfonamides and penicillin.

Add to these and other drugs an even greater number of proprietary mixtures, and one is impressed with the problem facing a critical student of the subject in an effort to evaluate the so-called drug approach to the treatment of acute necrotizing periodontal disease: drugs and drug mixtures by the score, each with its promoters and their testimony, but none with acceptable scientific evidence to establish their merit. Many of these were discussed in a previous report.[4]

A review of the articles in the literature on the therapy of acute necrotizing periodontal disease reveals the use of highly questionable criteria as the basis for judging therapeutic success. The various treatment methods are, for instance, judged by the number of treatments and days required for the acute symptoms to subside under a given treatment without knowledge as to what would have been the time requirement for this phenomenon without the advocated treatment. A critical student of the problem is unimpressed by such reports, since they have no scientific basis.

There are several basic methods by which therapeutic success may be judged accurately. In cases in which the average course of a disease process is established, remedies may be judged by the manner in which this course is altered in a significantly large and statistically valuable number of cases. Again, a large number of patients may be observed through the course of the disease, without treatment, and an equally large number of comparable patients may be observed while under a given treatment. A statistical analysis of comparative observations may cast light on the value of the applied remedy. A more critical method is the use of several remedies on a comparative basis, one remedy being used somewhat in the manner of a control and one or more others in comparison with it, with none of the remedies used in the study distinguishable one from the other by those making the observations. This has been designated as the "blind test" and has considerable merit. In the case of oral diseases in which comparable lesions prevail bilaterally, the lesions on one side of the mouth may serve as controls while those on the other side may serve as the experimental lesions. Such a program offers identical factors, both systemic and local, for the control and experimental areas except the therapeutic factor that is under study in the experimental area. It affords an excellent basis for objective study of a treatment program. None of these basic methods has been utilized fully in the studies reported to date on the therapy of acute necrotizing periodontal disease.

Measurement of Results

One who has reviewed the literature on the therapy of acute necrotizing periodontal disease, if at all critical in his analysis, must come to the conclusion that the commonly used standards by

4. Lyons, Harry, The Clinical Aspects and Therapy of Vincent's Infection of the Mouth, in Gordon, S. M., *Dental Science and Dental Art*. Philadelphia: Lea & Febiger, 1938, p. 439.

Fig. 1.—Sketch and photograph of normal gingival papillae

which results are judged are wholly inadequate from a strictly scientific point of view. More important than this, more acceptable methods of description of cases and of methods of measuring results need to be developed. The former may be accomplished with relative ease by discarding such descriptive terms as "mild," "medium" and "severe," now commonly used to classify the disease and by adopting instead a general program of more adequate descriptions with less emphasis on group classification.

For the latter, such questionable criteria as smear findings and subjective symptoms generally should be discarded, and to our objective clinical observations there should be added one observation as yet generally unappreciated. Of especially great importance in the consideration of acute necrotizing periodontal disease and its treatment is the appraisal of deformities in the periodontium at the end of treatment and their comparison with those, if any, that prevailed at the time treatment was undertaken. This is a criterion especially applicable to the problem under discussion. The peculiar natural course of acute necrotizing periodontal disease is such that this criterion so outweighs all others in value that it alone may be used as the basis on which to judge therapeutic success in this problem. Only this criterion among the many tells how successful any treatment of acute necrotizing periodontal disease may be. For an understanding of this point, it is necessary to review the natural course or what may be termed the behavior pattern of acute necrotizing periodontal disease.

Course of the Disease

Irrespective of varying causative factors or the region of first attack, acute necrotizing periodontal disease always starts in focal incubation zones, such as a deep gingival sulcus or the region under the gingival flap over a partially erupted tooth. These zones provide, among other conditions, marked reduction in oxygen tension. This reduction in oxygen tension is enhanced further by the characteristic fibrinous exudate and its membrane formation which tend to "glue up" the incubation zones, so to speak. At this stage of events the disease reaches its highest intensity. Necrosis and sloughing of tissue now occur, with the so-called punched out appearance of the interproximal papillae resulting. In this step in its behavior pattern the disease literally sloughs itself out of its incubation zone. The sulcus is eliminated and the intensity of the disease subsides. The altered anatomy of the interproximal tissues now no longer provides the environmental factors necessary for the acute intensities of the disease. It resolves itself to a chronic and

generally subjectively symptomless level, whether treated or not. It is yet to be shown that the myriad of drugs proposed for use here significantly alters this behavior pattern with the resultant tissue deformities.

In the adult whose teeth have reached their full stature of eruption the deformity created by the disease as it runs its acute course is usually a permanent one. Occasionally one is successful in encouraging the regeneration of the gingival papillae if they are not too badly damaged, but this is not the usual result. A permanent deformity usually persists with all the ensuing difficulties of maintaining a state of hygiene adequate for health of these tissues, the greater likelihood of disease recurrences and the loss of regional esthetics (Figs. 1 and 2).

The subsequent chronic course of the disease is interesting to trace. As previously stated, all other factors being equal, the intensity of necrotizing periodontal disease is in direct proportion to the quality of the environmental factors presented in the so-called incubation or focal zones. As the disease induces necrosis and sloughing of the gingival papillae or flap, it sloughs itself out of its incubation or focal zone, thereby radically altering the environmental factors. This is followed by a marked reduction in the intensity of the disease and its symptoms to those of a chronic level. The disease now continues under circumstances less favorable to itself but is nonetheless able to progress at a chronic and usually subjectively symptomless level under the "protection" and state of limited oxygen reduction provided by the fibrino-membranous feature of the disease. Ulceration continues to deform the interproximal region of the periodontium with the creation of markedly concave contours in this region. When these are made deep enough, they again provide qualities of environment more favorable to the exciting organisms, and the disease intensity mounts again to an acute level. Rapid necrosis and sloughing once more are noted until the disease again sloughs itself out of its recreated favorable focal zone and subsides to chronicity. Exacerbations and remissions occur time and again, based on the altered anatomy of the periodontium and a corresponding alteration in the quality of environmental factors, probably oxygen tension and hygiene in the main (Fig. 3).

Treatment by Débridement

From a description of the disease as it courses through its remissions and exacerbations, one may conclude that the preservation of the normal gingival papillae, without deformity, should be a primary objective of the treatment of

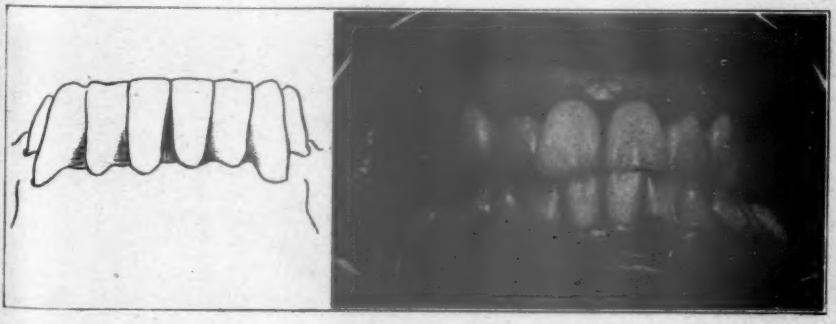

Fig. 2.—Sketch and photograph of gingival papillae crippled and deformed by initial attack of acute necrotizing periodontal disease. Condition allegedly was treated with success by medicinal means

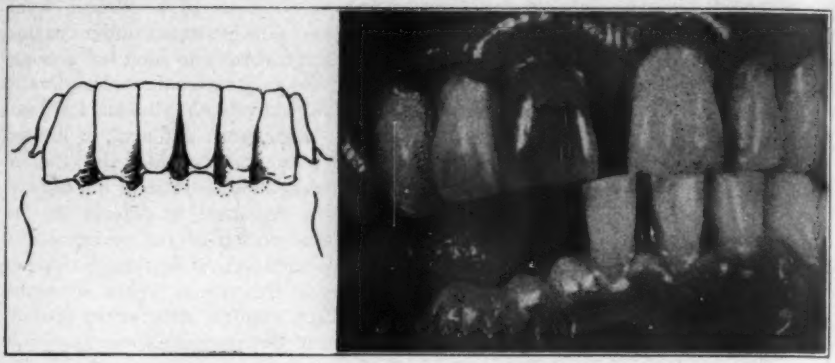

Fig. 3.—Sketch and photograph showing periodontium crippled and deformed by recurrent attacks of acute necrotizing periodontal disease. Each acute attack was reported successfully treated by medicinal means

the disease in its initial attack. Similarly, the results of treatment should be judged on this point. Instead the literature evaluates treatment methods by the number of days and treatments required to eliminate pain and other symptoms of acute infection and to secure certain questionable smear findings. Surely, crippling deformities are important considerations in studies of disease, and their prevention should be a paramount objective of treatment.

It may be stated as axiomatic that the longer a disease which tends to deform tissues continues, the greater will be the deformity. If this statement is accepted as axiomatic—and it would appear illogical to refuse to do so—then it follows logically that the method of treatment which avoids any deformity must be the quickest in obtaining good results. This is borne out by experience. It readily may be observed that the method that preserves the normal papillae without deformity is also the method that induces the disease and all its symptoms to subside and disappear the quickest. Avoidance of tissue deformity by a destructive disease obviously depends on its instant abortion.

In the instance of acute necrotizing periodontal disease, this may be accom-

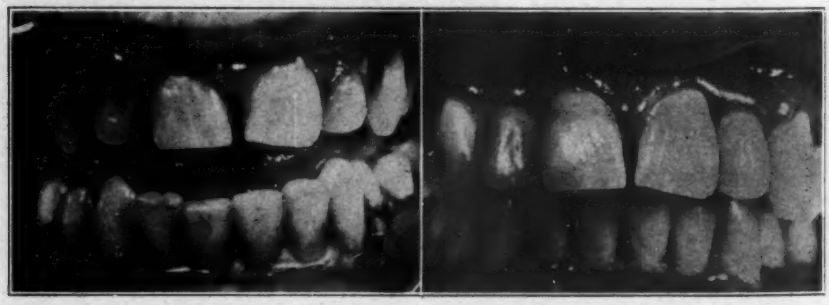

Fig. 4.—Acute necrotizing periodontal disease as presented (left) and forty-eight hours after debridement, with general supportive care (right). Destructive disease process instantly was aborted, and healing to an advanced degree may be noted

plished by taking a cue from the pattern of behavior of the disease itself. It has been noted that certain changes in the focal zones are accompanied or followed by changes in the course of the disease and that the highest intensity of the disease prevails when, so to speak, it "glues itself up" in an incubation zone.

Experience has demonstrated that early débridement of these incubation zones—careful instrumentation to open, cleanse, aerate and irrigate the focal incubation zones—instantly will abort the acute necrotizing periodontal diseases not primarily occurring as phases of fatal blood dyscrasias. The irrigation of the focal zone is accomplished automatically by the hemorrhage that is induced by careful instrumentation. Several things are accomplished at the same time. A more vigorous circulatory response, which the involved tissues lack, is excited; the zone is washed from its deeper recesses outward, and a blood clot is left in the site as nature's best dressing and the sine qua non of healing. Débridement of the focal zones, augmented by frequent saline washes, good hygiene and the supportive care which should feature the treatment of any infection, afford results more quickly than have been reported for other methods and with a maximum degree of tissue preservation. The over-all healing time varies with the healing properties of the sufferers, but the abortion of the destructive disease process is attained instantly by the recommended method (Fig. 4). It is important to recognize (1) the abortion of a destructive disease process and (2) the healing and repair of tissue damage as two distinct phases of the response to treatment of disease.

Drug Therapy

It is an impressive observation that in all the literature testifying to the alleged virtues of the various advocated drugs, penicillin included, not a single author has shown photographic evidence to indicate satisfactory results in the treatment of acute necrotizing periodontal disease without deformity of the gingival papillae as shown in Figure 5. The accompanying illustrations reveal the relative merits of treatment methods with particular regard to tissue destruction and gingival deformity. The results shown would indicate that penicillin applied locally is of questionable value as compared with immediate débridement.

The failure of the so-called drug therapy of acute necrotizing periodontal disease to produce results without tissue

Fig. 5.—Left: Case presented intensely acute necrotizing gingivitis in early stage, with lesions generally distributed. The right side, which appeared to be more severely involved, was treated immediately by débridement. Patient was advised to use 1,000 unit penicillin lozenges continuously during waking hours and also with regard to general supportive care. Penicillin used locally did not abort disease or prevent loss of gingival papillae on left side. Right: Right view showing preservation of gingival papillae without further loss of tissue

deformity indicates that it does not significantly affect the natural course of the disease process. The highly caustic drugs, such as chromic acid, probably shorten the acute course of the process by hastening or immediately inducing the destruction of the gingival papillae, thus eliminating the focal zones but meanwhile creating the gingival deformities characteristic of the disease process. This should not be judged as good therapy.

The emphasis on the use of drugs as directly acting antibacterial agents is open to serious question on several points. The rather general presence in most mouths, even though in small numbers, of the bacteria believed to be the exciting agents of acute necrotizing periodontal disease indicates that other factors of a predisposing nature are probably more important in its causation. Germicidal drugs cannot alter the latter. Even though a germicidal drug may act effectively against the exciting bacteria, it must be borne in mind that disinfection alone of a gingival sulcus or lesion can have only a limited effect on the disease process and that for only a relatively short period of time. This is now generally observed to be the case in the use of penicillin in these cases. The incidence of recurrences after the use of penicillin alone is reported as rather high, indicating its limited influence on the disease process from the broad view of its complete management.

The use of drugs in the treatment of acute necrotizing periodontal disease raises many other questions, such as their ability to reach and act on the bacteria actually responsible for exciting the disease process deep in the focal zones, their injurious influences on the hard dental tissues, their irritating action on the soft tissues of the mouth and their general toxic influences. In light of their unestablished merit, these considerations appear adequate to condemn their use.

Summary

A heretofore generally unappreciated objective and criterion of treatment of acute necrotizing periodontal disease has been presented; that is, preservation of the normal gingival papillae. Early débridement of the incubation zones is recommended as a method of therapy.

It is urged that the newly presented criterion be accepted as the standard by which all methods of treatment may be accurately judged. Methods of treatment that fail to attain this objective may be considered at least relatively ineffective.—*306 Professional Building.*

Hospital Conditions in Alaska.—General hospitals are grossly inadequate to meet the current medical needs of Alaska, and if a sudden emergency were to arise the situation would be catastrophic. . . . There are no mental hospitals anywhere in Alaska. . . . Positions for nurses, dentists and physicians are unfilled, with resultant serious effects on the over-all health problems.—*Harry E. Barnett and others, "Medical Conditions in Alaska," J.A.M.A. 135:8, October 25, 1947.*

VITAMINS, SULFONAMIDES AND ANTIBIOTICS IN PERIODONTAL THERAPY

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In the past quarter century three new groups of therapeutic agents, the vitamins, sulfonamides and antibiotics, have come into widespread use in medicine and dentistry and have affected profoundly the everyday practice of both professions. Indeed, it is unquestionably true that millions of lives have been saved through the use of these agents, and they frequently have been referred to as "wonder drugs."

Undoubtedly they are deserving of this approbation, but the fact that they have produced such spectacular results in many instances often has led both patients and their physicians and dentists to expect the impossible from them. All three of these groups have been, and still are being, used for many pathologic conditions in which they are pharmacologically incapable of producing beneficial results. In some instances this may result in actual physical harm to the patient, and in all such instances an insidious type of injury is done in that the patient or the professional man or both are relying on an irrational form of treatment and as a result established forms of therapy are neglected. Therefore, this paper will deal with both the values and the limitations and dangers of these drug groups.

VITAMINS

Investigations which have been carried out largely since the second decade of this century have demonstrated that factors other than proteins, carbohydrates, fats and minerals are essential to health. These factors are presently designated as vitamins. It is not easy to define a vitamin, but they should not be thought of as drugs. *New and Nonofficial Remedies*[1] (page 595) defines a vitamin as follows:

> A substance essential for maintenance of normal metabolic functions, not identical with the more familiar nutrients, not synthesized in the human body in normally adequate amounts, and therefore to be furnished by an exogenous supply, sometimes more labile than the foodstuffs proper and hence subject to deterioration, and distributed variously among the edible parts of animals and plants.

The vitamin group may be divided into two subgroups, the water-soluble and the fat-soluble vitamins. The water-soluble group includes vitamin C, or ascorbic acid, and the vitamin B complex, and the fat-soluble group includes vitamins A, D and K, which have proved value in human nutrition.

Ascorbic Acid

Since deficiency symptoms of the water-soluble group frequently are noted in the mouth, they are of greatest interest to the periodontist. Vitamin C, or ascorbic acid, has been established definitely as the antiscorbutic vitamin. It long has

School of Dentistry, University of Michigan.

1. Council on Pharmacy and Chemistry, American Medical Association, *New and Nonofficial Remedies*. Chicago: American Medical Association, 1946.

been established that scurvy produces oral symptoms, including subperiosteal hemorrhages and spongy, swollen, bleeding gums. In advanced cases actual loosening of the teeth occurs. Furthermore, the response of the oral symptoms in advanced scurvy may be quite dramatic when ascorbic acid therapy is instituted. However, there is little in the way of scientific evidence to indicate that periodontal disease or gingivitis in general is the result of vitamin C deficiency or will respond to ascorbic acid therapy.

Boyle and co-workers[2] have produced some experimental evidence suggesting that certain cases of periodontosis in man actually may be the result of mild chronic scurvy. On the other hand, Kerr and Crowley[3] showed that there was no correlation between low vitamin C blood levels and the incidence of gingivitis, and Burrill[4] in a study of the blood plasma of 1,396 patients found no significant difference in vitamin C levels among those having gingivitis and those free from gingivitis. Burrill suggested the possibility that a person who neglects his mouth also will neglect his diet, so that gingivitis and periodontitis may arise from the same neglect that allows the vitamin C level to be low. In short the poor nutritional condition and the poor oral condition both may result from the same tendency to neglect rather than the one being an etiologic factor for the other. In a further study of experimentally induced vitamin deficiencies in man for a period of seven months, Burrill was unable to show oral changes of any kind attributable to vitamin C deficiency.[5]

The English diet of the war years has offered some opportunity for the study of vitamin C deficiency states, and surveys conducted over a five year period have been reported by Sydenstricker.[6] He reported that subsistence on an ascorbic acid intake of about 20 mg. per day produced no evidence of widespread deficiency. These reports were confirmed by Yudkin,[7] and furthermore it was reported that no improvements in the sponginess or bleeding of the gums occurred when ascorbic acid was administered. Day and Shourie[8] found no decrease in gingivitis after feeding 100 mg. of ascorbic acid daily to East Indian children.

On the other hand, Roth[9] and others have reported some successful use of high doses (500 mg. daily) of vitamin C in the treatment of gingivitis, and it is definitely true that infants and certain patients on unusual diets may have distinct dietary deficiencies of this vitamin unless supplemental supplies are furnished. In general, sufficient quantities of this vitamin may be obtained by adjusting the diet to include supplies of citrus fruits, tomatoes, strawberries, green peppers, raw cabbage, vegetable greens, and fresh fruits and vegetables. When it becomes necessary to supplement the diet with synthetic ascorbic acid the adult protective dose is 25 mg. daily, and the therapeutic dose is 100 to 150 mg. daily.

It is certainly the duty of the periodontist to see that his patients have an adequate intake of vitamin C in their diets, but there is nothing in the way of confirmed scientific evidence presently available that should cause vitamin C to be considered a specific for Vincent's

2. Boyle, P. E.; Bessey, O. A., and Wolbach, S. B., Experimental Production of the Diffuse Alveolar Bone Atrophy Type of Periodontal Disease by Diets Deficient in Ascorbic Acid (Vitamin C). *J.A.D.A.* 24: 1768 (November) 1937.

3. Kerr, D. A., and Crowley, M. C., Relationship of Vitamin C to Gingivitis. *Mich. Univ. School Dent. Alum. Bul.* 43:14 (October) 1941.

4. Burrill, D. Y., Relation of Blood Plasma Vitamin C Level to Gingival and Periodontal Disease. *J. D. Res.* 21:353 (August) 1942.

5. Burrill, D. Y., Oral Conditions in Experimental Vitamin C and B Deficiency. *J.A.D.A.* 33:594 (May 1) 1946.

6. Sydenstricker, V. P., Nutrition Under Rationing in England. *J. Am. Dietet. A.* 20:4 (January) 1944.

7. Yudkin, John, Nutritional Status of Cambridge School Children. *Brit. M. J.* 2:201 (August 12) 1944.

8. Day, C. D. M., and Shourie, K. L., Effect of Vitamin C on Gingival and Periodontal Disease in Indian Children. *Indian J. M. Research* 31:153 (October) 1943.

9. Roth, H., Vitamins as Adjunct to Treatment of Periodontal Disease. *J.A.D.A.* 32:60 (January 1) 1945.

or other forms of gingivitis or periodontitis.

Further experimentation with high dosages of vitamin C in certain cases of resistant gingivitis would seem indicated, and fortunately there is no danger of toxicity in this connection. However, attempts to treat periodontal disease with vitamin C alone without the usual correction of localized predisposing factors almost certainly will end in failure.

Vitamin B Complex

Since several symptoms of deficiency of vitamin B complex appear in the mouth, this group of vitamins is also of paramount interest to the periodontist. At the present time seven compounds recognized as members of the vitamin B complex have been identified and are being produced synthetically. Three (thiamine, riboflavin and nicotinic acid) have definitely proved human uses, and a fourth (vitamin B_c, or folic acid) appears to be useful in the treatment of pernicious anemia, macrocytic anemia, sprue and nutritional macrocytic anemia (page 601).[1] The period of observation of these uses has not been sufficient for complete evaluation of folic acid as a therapeutic agent, but it appears that it is an important new member of the vitamin B complex. Three other members of the vitamin B complex (pyridoxine, pantothenic acid and biotin) have not yet been proved essential to the health of human beings.

Thiamine is the antiberiberi vitamin, and its deficiencies do not manifest themselves about the mouth. Riboflavin deficiencies produce cheilosis at the angles of the mouth. This frequently is accompanied by a typical glossitis in which the tongue is a definite magenta or purplish-red color. The tongue is clean in contrast to the glossitis of pellegra, and the papillae are flattened or mushroom-shaped rather than atrophic. The oral symptoms may be accompanied by ocular manifestations which include a mild photophobia and congestion of the scleras with keratitis. The symptoms of the mouth and eye respond readily to therapeutic doses of riboflavin, which should range between 2 and 10 mg. a day for the adult, depending on the severity of the deficiency.

Nicotinic acid, or niacin, sometimes is called the "p-p" or "pellagra-preventive" vitamin. The oral symptoms of its deficiency include a scarlet swollen tongue with atrophic papillae. There is liable to be severe ptyalism, and in severe cases the oral symptoms may be accompanied by diarrhea and vomiting. The skin usually shows characteristic scaly erythematous eruptions, and there may be involvement of the nervous system, with such symptoms as headache, dizziness, insomnia, depression, delusions and hallucinations.

There is some evidence that deficiency of nicotinic acid may be a predisposing factor in Vincent's infection. For example, Spies[10] has reported that nearly all patients with severe pellagra of the oral cavity have a secondary but extensive infection with Vincent's organisms. On the other hand, Miller and co-workers[11] reported that the use of large doses of nicotinic acid in 10 cases of acute Vincent's infection failed to produce beneficial results. Both Miller and Rosebury[12] have pointed out that the oral lesions of patients with nicotinic acid deficiency are not the same clinically as those of patients with Vincent's infection. Thus, it appears that although lack of nicotinic acid may be a predisposing factor in certain cases of Vincent's infection,

10. Spies, T. D., Treatment of Pellagra. *J.A.M.A.* 104:1377 (April 20) 1935.

11. Miller, S. C.; Greenhut, W. M., and Roth, Harry, Nicotinic Acid and Vincent's Infection (a Preliminary Report). *New York Den.* 10:424 (November) 1940.

12. Rosebury, Theodor, The Etiology of Vincent's Infection, in Gordon S. M., *Dental Science and Dental Art*, Philadelphia: Lea and Febiger, 1938, p. 415.

it cannot be considered to be a specific for this condition.

Certainly the periodontist should be ready to diagnose the oral symptoms of pellagra and either to prescribe nicotinic acid or to refer the patient for treatment elsewhere if there is evidence of the general symptoms of pellagra. The maximum therapeutic dose of nicotinic acid is 500 mg. a day, given in ten doses of 50 mg. each. It should be emphasized that multiple deficiencies of the vitamin B complex occur and that it may be necessary to prescribe concurrently both nicotinic acid and riboflavin to clear up the symptoms in the mouth.

Fat-Soluble Vitamins

The fat-soluble vitamins are of less significance to the periodontist than the water-soluble group. The proved human uses of vitamin A have to do with the treatment or prevention of nyctalopia, or night blindness, and a characteristic eye disease called "xerophthalmia." There are reports by Boyle[13] and Mellanby[14] that hypoplasia of the enamel may occur in human beings as a result of vitamin A deficiency during the formative stages of the teeth, but there seems little possibility that it will be of value in the treatment of periodontal diseases.

Vitamin D is of importance during the development of the teeth and supporting structures, but its relationship to dental caries is controversial, and the Council on Dental Therapeutics[15] (page 191) has stated, "Claims to the effect that an adequate intake of vitamin D will prevent dental caries are unwarranted."

Vitamin K is of interest in periodontia only in reference to its role in the clotting of blood. Vitamin K is essential to the maintenance of a normal prothrombin level, without which the mechanism of clot formation cannot proceed at a normal rate. Primary deficiencies of vitamin K are rare, but the vitamin cannot be absorbed when the normal absorption of foods is prevented by obstruction of the flow of bile or by intestinal disease. In these states, vitamin K is effective in controlling the resulting hemorrhagic condition. The dose is 4 to 10 mg. by mouth, accompanied by bile salts if the condition results from stoppage of the flow of bile. Menadione and several other synthetic vitamin K preparations, some of which are water-soluble and may be administered parenterally, are now available. Recent work indicates that certain synthetic vitamin K preparations may inhibit the dental caries process,[16, 17] but present evidence should be confirmed and extended before extensive practical application is attempted.

Summary on Vitamins

To summarize briefly the relation of vitamins to periodontia, it would seem that certain deficiency states of ascorbic acid, riboflavin and nicotinic acid may manifest themselves in or about the mouth and that these deficiency symptoms are directly amenable to treatment by these respective vitamins. On the other hand, in the light of present data it would be a mistake to consider any one of these vitamins or any combination of them to be specific for Vincent's infection or other forms of periodontal disease, and attempts to use them to the exclusion of well established forms of therapy will result in only partial success or complete failure.

13. Boyle, P. E., Manifestations of Vitamin A Deficiency in a Human Tooth Germ. *J. D. Res.* 13:39 (February) 1933.
14. Mellanby, M., Influence of Diet on Structure of Teeth. *Physiol. Rev.* 8:545 (October) 1928.
15. Council on Dental Therapeutics, American Dental Association, *Accepted Dental Remedies.* Chicago: American Dental Association, 1947.
16. Calandra, J. C.; Fancher, O. E., and Fosdick, L. S., Effect of Synthetic Vitamin K and Related Compounds on the Rate of Acid Formation in Saliva. *J. D. Res.* 23:31 (February) 1944.
17. Burrill, D. Y.; Calandra, J. C.; Tilden, E. B., and Fosdick, L. S., The Effect of 2-Methyl-1, 4-Naphthoquinone on the Incidence of Dental Caries. *J. D. Res.* 24:273 (December) 1945.

SULFONAMIDES

In 1935, a new group of chemotherapeutic agents, the sulfonamides, was introduced into general use in medicine. This was an historical event in medical history because for the first time it gave the healing arts a specific drug for the treatment of systemic bacterial infections. The sulfonamides soon were applied to the treatment of severe sulfonamide-sensitive infections of dental origin by systemic administration, and in 1937, Sinclair[18] reported the first application of sulfonamides locally in dental practice.

Hazards

When contemplating the use of sulfonamides the therapist must always keep in mind the fact that he is dealing with a potentially toxic and dangerous group of drugs. In 1943, Long[19] estimated that there had been as many as 5,000 deaths from sulfonamide toxicity, and of course many more have occurred since then. The limitations of space will not permit a discussion of sulfonamide toxicity in this paper, but every physician and dentist who proposes to use these drugs owes an obligation to himself, his patient and his profession to familiarize himself thoroughly with their dangers.

In addition to the direct toxic effects of these drugs, there is the sensitization problem to be considered. A patient may tolerate an initial course of sulfonamide therapy with little or no reaction to the drug, but when the drug is administered again weeks or months later the patient may show a rapid and serious toxic reaction. This generally is agreed to be a type of allergic reaction produced by an acquired hypersensitivity which may develop after injection of even small amounts of the drug.[19] Furthermore, it should be emphasized that absorption from local application, as well as absorption from the gastro-intestinal tract, may cause sensitization. The incidence of sensitization is hard to estimate, but all investigators agree that it is far from negligible. Bloom[20] estimated that a third of those persons receiving sulfonamide therapy become sensitized. Lyons and Balberor[21] observed "drug fever" reactions in 36 per cent of patients on re-administration of sulfathiazole. Dowling and Lepper[22] noted febrile reactions on re-administration of sulfathiazole in 16 per cent of cases, sulfapyridine in 9 per cent and sulfadiazine in 7.4 per cent. Fortunately the incidence of sensitization and sensitization reactions has been small in dental topical uses, but some have been reported.

Another hazard of indiscriminate sulfonamide medication is the fact that some organisms readily build up a resistance to sulfonamides when repeatedly exposed to them. As a result, infections caused by these organisms with acquired resistance will not yield to treatment with sulfonamides. One of the best examples of this phenomenon is the gonococcus. When sulfathiazole first was introduced, a high percentage of cases of gonorrhea readily yielded to it, but now many strains of gonococci have become sulfathiazole-resistant and infection with these strains cannot be treated successfully with this drug.

When the sulfanamides are used locally in open wounds, such as tooth sockets, or as packs in regions where periodontal pockets have been subjected to surgical treatment, it must be remembered that there is danger that large

18. Sinclair, J. A., A Preliminary Report on the Local Use of Sulfanilamide in the Treatment of Oral Lesions. *J. Canad. D. A.* 3:571 (November) 1937.

19. Long, P. H., Toxic Manifestations of Sulfonamide Therapy. *J. Connecticut M. Soc.* 7:6 (January) 1943.

20. Bloom, David, Misuse of Sulfonamide Compounds. *Arch. Dermat. & Syph.* 49:249 (April) 1944.

21. Lyons, R. H., and Balberor, H., Febrile Reactions Accompanying Readministration of Sulfathiazole. *J.A.M.A.* 118:955 (March 21) 1942.

22. Dowling, H. F., and Lepper, M. H., "Drug fever" Accompanying Second Courses of Sulfathiazole, Sulfadiazine and Sulfapyridine. *Am. J. M. Sc.* 207: 549 (March) 1944.

quantities of them will act as foreign bodies and delay healing. This is particularly true when the sulfonamides are used in any form which will cake or harden in the wound. In collaboration with Kerr, I[23] recently reported dog experiments in which the sulfonamides, when applied in large quantities or in forms which would harden in the socket, definitely were demonstrated to delay healing of extraction sockets.

Criteria for Administration

In reviewing these several potential hazards of sulfonamide therapy, there is no intent to discourage the rational use of sulfonamides in either medicine or dentistry. However, in view of these hazards it is felt that three criteria should be considered before the sulfonamides are used either systemically or locally. 1. Is the infection to be treated sulfonamide-sensitive? If not, the application of sulfonamides will be valueless. 2. Is there an equally effective way to treat the infection? If so, the patient should not be exposed to the hazards of sulfonamide therapy. 3. Does the patient have a history of sulfonamide reactions? If so, the use of sulfonamides will be extremely hazardous.

When these criteria are applied to proposals to treat Vincent's infection and other periodontal infections with sulfonamides, there would appear to be little indication for such use of this drug group. Again, space will not permit an extensive review of the literature in this connection, but a careful study of the many articles which have been published has failed to convince me that it is necessary or desirable to use sulfonamides for the treatment of ordinary Vincent's stomatitis or streptococcal stomatitis. Other established forms of treatment generally appear to give equally good, if not better, results without the inherent dangers connected with any form of sulfonamide therapy.

The only possible exception to this point of view would seem to be those instances of a true Vincent's angina in which there is extensive tonsillar and peritonsillar involvement. In these instances it is difficult to reach the organisms with topical medication, and some evidence is available to support the use of systemic sulfonamide therapy. However, it seems pertinent to point out that since penicillin has become generally available we now have a less dangerous and apparently more effective means of systemic medication of Vincent's angina.

View of Council on Dental Therapeutics

Because sulfathiazole gum has been promoted extensively for use in the treatment of Vincent's infection, a brief statement concerning its present status would seem in order. The Council on Dental Therapeutics recently has reported on this product.[24] In this report the evidence available to the Council in regard to sulfathiazole gum is reviewed carefully, and the following conclusion is drawn:

> The evidence is not yet at hand to prove that sulfathiazole gum is superior to other methods of treatment which do not have the potential hazard of serious sensitization reactions, and consequently the Council has found this product unacceptable for *Accepted Dental Remedies.*

In fact, the whole problem of sulfonamides in periodontia perhaps best can be summarized by quoting another statement of the Council on Dental Therapeutics[15] (page 126).

> In general, claims for the effectiveness of sulfonamides locally in the treatment of Vincent's infection of the mouth, pyorrhea or other periodontal conditions. . . . are unwarranted on the basis of present evidence.

23. Ostrander, F. D., and Kerr, D. A.: Recent Trends in Use of Sulfonamides. *J.A.D.A.* 35:461 (October 1) 1947.

24. Council on Dental Therapeutics, American Dental Association, The Present Status of Sulfathiazole Gum. *J.A.D.A.* 34:700 (May 15) 1947.

ANTIBIOTICS

The early years of the present decade witnessed the introduction of the drug group known as the antibiotics. These are chemical substances produced by micro-organisms or higher plants which are capable of inhibiting the growth or destroying the vitality of pathogenic micro-organisms.

Penicillin

Fleming[25] first called attention to the potential importance of this group when he reported in 1929 that the mold Penicillium notatum elaborated a substance which would inhibit the growth of certain micro-organisms on agar plates. Fleming was well aware of the possibilities of this substance which he called penicillin, but it was difficult to produce and to isolate and a decade passed before any real progress was made toward its practical application. In the early 1940's, World War II made the need for more effective antibacterial agents acute, and penicillin again was studied. Small quantities were isolated and used experimentally with such excellent results that the governments of England and the United States collaborated in subsidizing an enormous program. This resulted in the production of adequate supplies of penicillin and its introduction into widespread use in the medical and dental fields. The results of the introduction of this drug were so spectacular and are so well known that they need not be recounted here.

In 1944, Strock[26] reported that patients who received penicillin parenterally for various systemic infections showed improvement in gingival and oral ulcerations which were present at the time, and by 1945 reports of successful treatment of Vincent's infection with penicillin began to appear in the literature. Schwartz[27] reported a series of 14 cases of severe Vincent's infection in which penicillin was given intramuscularly. A total dose of 100,000 to 200,000 units was given in 20,000 unit doses every three hours. He reported that there was always improvement within four to six hours. The temperature returned to normal, and the discomfort was alleviated within twenty-four hours. Cofield and associates[28] presented a report on the treatment of Vincent's infection by topical packs and spray, using dilutions of 250 to 500 units to each cubic centimeter of physiologic salt solution. In January 1945, MacGregor and Long[29] reported the treatment of Vincent's infection with pastilles which slowly dissolved in the mouth, releasing penicillin. They concluded that Vincent's infection could be treated more simply and more quickly by use of penicillin pastilles than by any other method. Thexton and Dick[30] reported the use of penicillin packs for Vincent's infection, with excellent results.

Present Trends

These early reports have been followed by so many additional articles that it is obviously impossible to review them in detail here, but a brief résumé of present trends would seem to be in order. Fortunately the more recent articles have a more conservative trend, with much emphasis being placed on the fact that the usual procedures for correction of poor oral hygiene, traumatic occlusion, over-

25. Fleming, A., On Antibacterial Action of Cultures of Penicillium, with Special Reference to Their Use in Isolation of B. Influenza. *Brit. J. Exper. Path.* 10:222 (June) 1929.

26. Strock, A. E., Relationship Between Gingivitis and Penicillin Administration. Preliminary Report. *J.A.D.A.* 31:1235 (September 1) 1944.

27. Schwartz, B. M., Effectiveness of Penicillin in Treatment of Vincent's Angina. *J.A.M.A.* 128:704 (July 7) 1945.

28. Cofield, K. R.; Ferguson, E. W., and Toye, A. E., Topical Application of Penicillin in the Treatment of Vincent's Infection. *J.A.D.A.* 32:529 (May 1) 1945.

29. MacGregor, A. B., and Long, D. A., Penicillin Pastilles in the Treatment of Acute Ulcerative Gingivo-Stomatitis (Vincent's Type). *Brit. D. J.* 78: 33 (January 19) 1945.

30. Thexton, R., and Dick, P. K., Penicillin Packs in the Treatment of Vincent's Infection. *Brit. D. J.* 78:299 (May 18) 1945.

hanging restorations and other predisposing factors must be carried out. In short the present tendency, which appears to be on a rather sound basis pharmacologically, is to regard penicillin as a valuable adjunct in the treatment of the acute phase of Vincent's infection but not as a specific curative agent which will be completely effective without the use of the usual manipulative procedures. The available evidence indicates that the use of penicillin will result in a fairly rapid reduction in the number of Vincent's organisms and improvement in the subjective symptoms within twenty-four to forty-eight hours. On the other hand, it is becoming apparent that recurrences of the acute phase or development of a chronic Vincent's infection may be anticipated in many instances unless both local and systemic predisposing factors are eliminated.

Penicillin Troches

There has been some disagreement as to the optimum method of using penicillin. Apparently a few clinicians have preferred to use intramuscular injections, but the vast majority appear to prefer the use of one of the several forms of penicillin troches which are now available and are accepted by the Council on Dental Therapeutics. From the pharmacologic standpoint it is difficult to understand why intramuscular injections of penicillin should be more desirable than local applications unless a true Vincent's angina with involvement of the tonsillar and peritonsillar region is present. Much greater concentration of penicillin can be maintained locally in the saliva by the use of penicillin troches than possibly could be obtained by intramuscular injections, and from the standpoint of the comfort of the patient and the convenience to the dentist, the advantage obviously lies entirely with the troches. The usual troche contains 1,000 units of penicillin in a vehicle which slowly will disintegrate in the saliva, releasing the penicillin which then becomes dissolved in the saliva. Many reports of successful use of this type of troche or lozenge have appeared in the literature.

Another type of troche which is accepted by the Council on Dental Therapeutics is the penicillin chewing troche, a preparation of penicillin in a paraffin base. The penicillin is released slowly during the process of chewing. The preparation now on the market contains 20,000 units in each troche, which is probably more than is necessary for application at any one time. Therefore, in clinical application of this product I have instructed the patient to divide the troche into quarters and to chew one quarter at hourly intervals. Excellent clinical results after use of this product in the treatment of the acute phase of Vincent's infection have been observed, but a word of warning is in order in that it may be painful for patients who have acute infection to chew this preparation.

In a limited series of cases of streptococcal gingivitis I have seen some excellent clinical results from the use of penicillin troches.

Potential Hazards

No discussion of the use of penicillin in the treatment of Vincent's and other periodontal infections should be closed without pointing out that there are certain potential hazards in such use although they are by no means as great as in the case of the sulfonamides. It is now well known that certain people are sensitive to penicillin, and some rather severe oral reactions to penicillin have occurred. Phillips[31] reported cases of stomatitis and glossitis in from 4 to 18 per cent of patients in several series of cases of mouth and throat infections in which calcium penicillin lozenges were given. However, this is a much higher percentage than has

31. Phillips, Edward, Glossitis and Stomatitis Due to Penicillin Lozenges and Troches. *Permanente Found. Med. Bull.* 4:90 (February) 1946.

been reported by most investigators, and in our experience at Michigan we have seen only one clinically significant reaction. In this one instance rather large bullae developed over the surface of the soft palate and then ruptured, forming ulcers ranging up to 3/16 inch. In appearance the lesions resembled large aphthous ulcers and were very painful, but they cleared up rapidly and uneventfully when the penicillin was withdrawn. Certainly when penicillin is being used topically in the mouth the dentist should be on the alert for possible reactions and the drug should be withdrawn when they appear. Fortunately penicillin reactions are seldom dangerous though they may be extremely unpleasant.

The question of whether penicillin-resistant strains of organisms may be produced by exposure to penicillin during this type of treatment is still controversial. Kolmer and Rule[32] and Tung and Frazier[33] recently have presented evidence indicating that Treponema pallidum cannot be made penicillin-resistant by exposure to penicillin concentrations which do not destroy it.

Further work will be necessary before this point can be clarified, but in the meantime the possibility that the production of resistant strains may occur is great enough to indicate conservatism in the use of penicillin. Certainly this possibility and the possibility of unpleasant penicillin reactions would indicate that this drug should be reserved largely for the severe or resistant case and not used routinely whenever mild gingival irritations present themselves.

Systemic Administration

Although the indications for systemic use of penicillin are not presented frequently in periodontia, it should be pointed out that systemic application of penicillin is indicated when severe infections which are caused by penicillin-sensitive organisms occur in and about the mouth. Also work now in progress indicates that penicillin may be valuable as a prophylactic premedication before dental extractions to prevent the development of subacute bacterial endocarditis in those persons with damaged heart valves.

Four general methods of systemic administration are now practiced. First, the drug may be given intravenously in saline solution. However, this seems unnecessary except in special instances. Second, penicillin may be administered intramuscularly in saline solution. When this is done doses must be repeated about every three hours in order to maintain an effective blood level. The usual dose will range between 15,000 and 40,000 units depending on the type and severity of the infection. Third, penicillin may be given intramuscularly in a peanut oil-beeswax vehicle which slows down its absorption and makes it possible to maintain an effective blood level for from twelve to twenty-four hours with one injection. The usual dose for this preparation is 300,000 units in 1 cc. of the oil-wax mixture. This method has an obvious advantage in the case of ambulatory dental patients in that injections need be given only once or twice a day as compared with the six or eight injections necessary when penicillin is given in saline solution. The fourth method of systemic administration of penicillin is by mouth. This is the least reliable in that absorption is variable, and therefore severe and dangerous infections should be treated by intramuscular administration. However, in cases of less severe infections the oral administration of penicillin is successful. Since it must be given in amounts four to five times greater than that given intramuscularly, this usually means doses of 100,000 units every three hours day and night. It must be given at

32. Kolmer, J. A., and Rule, A. M., Acquired Resistance of Treponema Pallidum to Penicillin. *Proc. Soc. Exper. Biol. & Med.* 63:240 (November) 1946.

33. Tung, Tuan, and Frazier, C. N., Penicillin Sensitivity and Morphology of Reiter Strain of Treponema Pallidum After Cultivation in Media Containing Penicillin. *Am. J. Syph., Gonor. & Ven. Dis.* 30:205 (May) 1946.

least a half hour before or one and a half hours after a meal, since it is best absorbed when the stomach is empty.

Other Antibiotics

No discussion of the antibiotics would be complete without pointing out that two other important members of this group, in addition to penicillin, are already in extensive use. Streptomycin is effective against many gram-negative organisms which are resistant to penicillin; and tyrothricin, which is too toxic for systemic use, is being used extensively topically in medicine. In addition to these, there are literally hundreds and perhaps thousands of antibiotics known to exist in the micro-organisms and higher plants of the earth. Some of these already are receiving critical study. Although the processes of isolation and study of antibiotics and the formulation of processes for their manufacture are long and tedious, there seems every reason to believe that more antibiotics will find a useful place in therapeutics in the near future.

CONCLUSIONS

In final résumé, in this article an attempt has been made to evaluate the application of the newer drugs in periodontia largely on the basis of the known pharmacologic characteristics. From the standpoint of the teacher of dental pharmacology and therapeutics thus attempting a critical appraisal of the uses of vitamins, sulfonamides and antibiotics in clinical periodontia, the following conclusions would seem justified on the basis of presently available evidence:

1. The potential hazards in the use of the sulfonamides are extensive. Since there is little evidence that would indicate them to be superior to other less hazardous forms of treating periodontal infections, there seems little rational reason for their use.

2. The vitamins and penicillin would appear to be valuable adjunctive agents in the treatment of certain periodontal conditions, but there has been too much of a tendency to consider them "wonder drugs" which would eliminate the "work" in periodontia. Unfortunately there seems no logical basis for such a conclusion, and the successful periodontist will continue to be the one who not only is skilled in the application of drugs but also practices meticulous correction of the many well known predisposing factors which contribute to periodontal disease.

3. Although the vitamins and antibiotics have established values as presently used in periodontia, much still remains to be clarified in the way of optimum methods of application and as to their limitations.

A great challenge for further critical study of these drug groups faces the clinical periodontists. Particularly in the field of the antibiotics, further extensive and well controlled studies are needed to complete the evaluation of penicillin and to explore the possibilities of the several other members of this group which probably will become available in the immediate years to come.

CLINICAL CHANGES OF THE GINGIVA IN PERIODONTAL DISEASE

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MAN has eyes, but he sees not. How often has one looked at his watch for the time, and then, if asked the hour, has had to glance at his timepiece again to make certain before answering? Many unobservant individuals who carry a timepiece, if asked directly whether it bears the number "six," cannot reply honestly without looking at it first.

This is analogous to what happens when the average dentist examines the mouth of his patient and actually does not see what is there to be recorded for the benefit of the patient's dental health. He has become so accustomed to looking without seeing that unless his attention is called to certain points by the patient, he does not at all times make proper note of existing conditions.

Practices are being destroyed today because of the attitude of dentists toward this so-called nonproductive aspect of the profession, the science and valuable practice of periodontia. Many patients have changed their dentists because those to whom they were going neglected to recognize gingival lesions or were interested only in constructing replacements. The roster of dissatisfied patients is increasing daily. The present day patient, because of advertisements, literature on care of the mouth or education by other means, is demanding better attention on the part of the dentist. He wants his teeth preserved from caries and from periodontal disease, and since the majority of teeth extracted from adults are lost because of inattention to the supporting structures, it is necessary that these foundations be safeguarded.

Most cases of periodontal disease can be prevented. The dentist will find this to be true if he first becomes thoroughly acquainted with all the early diagnostic signs. They should be investigated as soon as they appear, and every deviation from the normal must be considered. Careful interpretation of well angulated, exposed and developed roentgenograms will reveal in many instances the onset of periodontal disease long before tissue changes occur clinically. One should make a diagnosis before teeth become so hopelessly involved that nothing can be done for them. Let us once and for all put an end to the ancient idea that pyorrhea cannot be cured. The blame for this notion falls on the negligent and indifferent practitioner. In most cases periodontal disease can be cured, and teeth can be made to render efficient service so that they will last for one's normal span of years.

The Normal Gingiva

Before describing the appearance of pathologic conditions of the gingiva, it may be wise to review briefly the normal appearance. In a young adult, say between the ages of 21 and 28, the gingival tissue should be of a dull salmon pink color, uniform in shade from its margin to the point at which it joins or becomes the areolar mucosa. It should be firm in texture, present a stippled appearance and fill each interproximal

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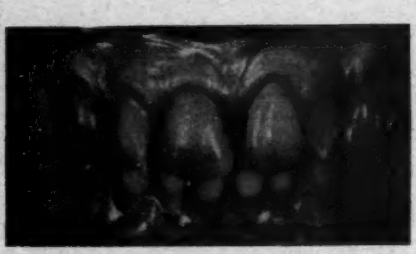

Fig. 1.—Gerontal atrophy in a 60 year old patient. Tissue tone and color are normal. Highlights and saliva mask the stippling. The upper right central incisor has a jacket crown

space. The margin should extend in a graceful unbroken parabolic curve from one interproximal crest to the next, and should be thin and closely adherent to the teeth. The margin should be attached at its base at the cemento-enamel junction, leaving a sulcus or crevice up to 2 mm. in depth.

As the patient advances in years, the attachment and margin of the gingiva may recede or appear to recede in an apical direction (Fig. 1). This is due to such processes as continuous eruption and atrophy. This condition usually is called senile atrophy or recession. The word "senile" should be displaced by the more modern terms "gerontal" or "gerontic," words that do not have quite the decrepit connotation of the word "senile." The term "gerontal" now is used widely in the field of medicine, and is appropriate in the foregoing instance.

Except for this recession, which may affect the septal papillae as well, all other characteristics should be the same as those of the normal gingiva of a young adult. Any change from the normal picture described here should be investigated carefully, and its cause, if possible, determined.

Early Indications of Disease

The clinical signs of early pathologic changes in the gingiva are of two types. The first is the change of color. The degree of variance from the normal indicates to some extent the depth and region involved. The second sign is the altered line of contour. These are extremely important signs that require constant and vigilant observation in order to forestall further complications.

Marginal Gingivitis

An easily detected gingival condition is that marked by a marginal color change, which may involve one or more teeth. Marginal gingivitis, as its name implies, extends only as far as the attachment of the margin (Fig. 2, left). At its inception, the color change may not be particularly noticeable. However, it often remains undetected and progresses to a deep pink, a red or even a blue color, according to the factor that is responsible for the lesion. It often appears as if a colored pencil traced the margin of the gingiva. If these signs escape notice, the lesion may progress until the attachment to the tooth is affected and a pocket is formed. An exudate may be present, but it usually is not in the simple marginal cases.

Gingival Edema

In gingival edema the gingival tissue is involved to a greater depth, with congestion or circulatory disturbances (Fig. 2, right). The tissue is spongy and nonresistant, and stippling is lost. Although the appearance may suggest deep pocket formation, pockets are not necessarily present. The inflammatory process may penetrate to the entire depth of the septal tissue.

Marginal Thickening

Another type of change is marginal thickening. The marginal gingiva takes on a festooned apearance and is forced in an apical direction. This can progress until much of the root is exposed. The gingival festoons are of two types, one being firm and the other soft or spongy. In the firm type the tissue color may be nor-

Fig. 2.—Left: Several types of gingival disturbance. Simple marginal gingivitis is present about upper anterior teeth where toothbrush never touched. Gingival festoons caused by improper brushing are present in lower cuspid areas. A small cleft as a result of occlusal trauma is apparent at neck of lower right lateral incisor. Deeply colored area about lower left lateral incisor is simple gingivitis caused by calculus. Right: Detachment of tissue involving all lower anterior teeth. Edema about upper teeth does not extend very deep, but in lower gingival tissue it extends to the areolar mucosa. A mild blast of air will force this tissue away from the teeth to the depth of its attachment. Firmer type of hypertrophic tissue between upper left central and lateral incisors has caused separation of these teeth

mal, and the condition is usually the result of faulty brushing technic or bad oral habits (Fig. 3, left). Festoons of the soft or spongy type have a reddish color (Fig. 3, right) and may be caused by traumatic occlusion or the breaking down of an unusually thin labial bone.

Proliferative Gingivitis

Another pathologic condition sometimes manifested consists of multiple small fissures or frayed edges on the margins of the gingiva (Figs. 3, right, and 4, left). These fissures may vary from ½ to 1 mm. in depth. On a hasty first glance it may appear that the tissue was cut in several places by an instrument. The color is a fairly bright red, and hemorrhage may be induced easily. This type of gingivitis is termed proliferative,

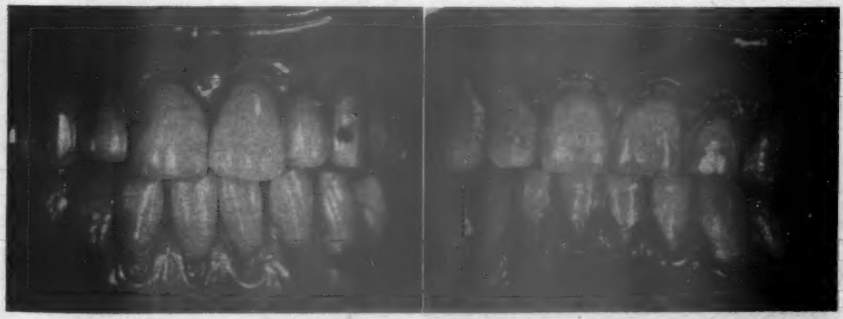

Fig. 3.—Left: Festoons caused by thickening of the marginal gingiva. The tissue is firm and resistant. It is well massaged, but the toothbrush technic is improper. Note abrasion of the necks of most teeth. Right: Mild type of proliferative gingivitis on upper gingiva. Hypertrophic tissue, which is splitting as it attempts to pass the contact points, is seen about many teeth. Festoons of the soft type are present about the lower anterior teeth. The cause is lack of proper oral hygiene and some trauma

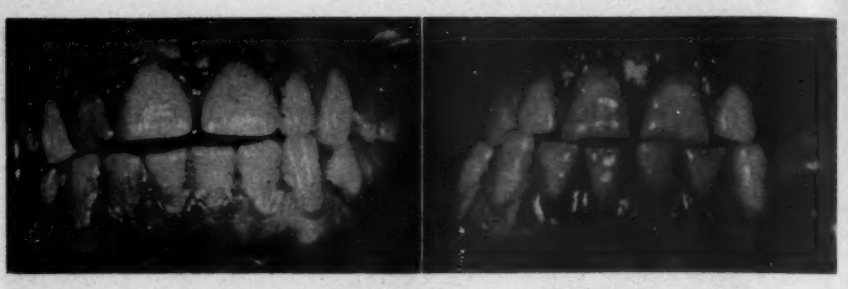

Fig. 4.—Left: Proliferative gingivitis. Patient has open bite. All upper anterior teeth have jacket crowns with rough margins. Note the frayed edges of the gingiva, especially about the upper central incisors. Distended arterioles may be seen in the upper gingiva. Right: Mouth of a diabetic patient. The proliferations are marked. This is one of the many conditions that may be seen in the mouths of diabetic patients

as the fissures are the result of cellular growth of the tissues between them. It is caused by both local and systemic conditions, and may be found associated with diabetes (Fig. 4, right). Gingival crescents, as the name implies, are small crescent-shaped areas involving only a segment of the gingiva of a tooth (Fig. 5). They are dull red in color and may extend to a considerable depth. The outline of the color is usually indicative of the depth and form of the pocket. On application of pressure, an exudate appears at the gingival crevice. At times the inflammatory process ruptures the labial surface of the tissue, producing what is known as a gingival cleft (Fig. 2, left). The tissue on each side of the cleft is ragged, showing the results of the ulcerative process. The cleft is usually a vertical line but the base of the crescent may be round or horizontal.

Fig. 5.—Gingival crescent in the tissue over the lower right central and lateral incisors. The breakdown involves only a segment of the tissue surrounding the tooth. The cause is traumatic occlusion

Septal Tissue

In the examination of a patient's mouth, a probe placed under the gingival margin at the interproximal surface and gently pulled to the side may reveal a detachment of the septal tissue (Fig. 2, right). It may involve one tooth, but usually includes a series of adjacent teeth. The labial septal tissue is detached from the lingual tissue. The marginal gingiva also can be retracted, the attachment having moved apically. The circulatory disturbance may extend to the areolar mucosa, and the tissue itself has a hypertrophic appearance.

In a true hypertrophic gingivitis, the septal attachment remains intact to a degree, the exception being where the tissue enlarges in an occlusal direction. In passing the contact point, the tissue may divide or it may force itself through, spreading the teeth apart. Hypertrophy usually involves the septal tissue primarily, and its cause may be either local or systemic. It may be of two separate types. The soft variety (Fig. 3, right), in which the tissue is spongy and nonresistant to palpation, is produced by local

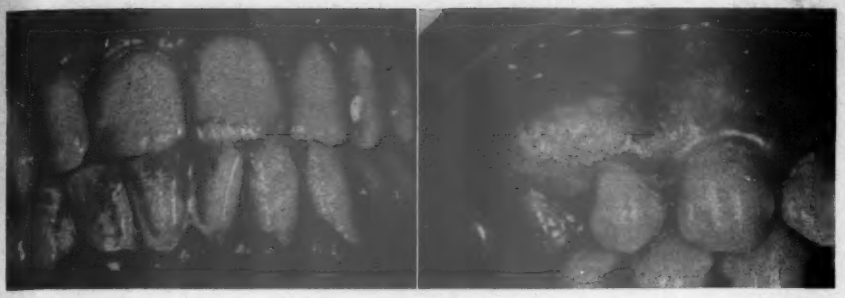

Fig. 6.—Left: Mouth of a patient with acute Vincent's infection. The disease has caused the loss of the papillae between most of the anterior teeth. Right: Pseudopapilla between upper first and second biscuspids

irritative factors or malalinement of teeth. The firmer or resistant type (Fig. 2, right) may be caused by endocrine disturbances, drug idiosyncrasies or other nonlocal factors. Pregnancy tumors are not considered as true hypertrophic gingivitis.

Two other types of changes in septal tissue deserve mention. One is the partial or complete loss of the papillae (Fig. 6, left). A common cause of this condition is Vincent's infection, but it also may result from other types of oral infections, or destruction of the tissue by caustic drugs or surgical procedures.

Secondly, there is the so-called pseudopapilla, or false papilla (Fig. 6, right). It may take the form of an extension of the papilla or of a small growth from the region where the papilla has been destroyed.

Discussion

If any of the early signs are disregarded, the result is a continued breaking down of the tissue until periodontal pockets are formed. Treatment begun at this later stage necessarily must be more complex and prolonged, and satisfactory results are less certain to be attained.

No attempt has been made in this paper to outline all of the reasons for the changes mentioned. Such a project would require far more space and would involve a discussion not only of the influence of local factors but also of systemic disturbances with their associated complexities.

It is incumbent on the dentist who is sincerely interested in his work and desirous of doing his best for the patient to train his eye to detect quickly all deviations from the normal appearance of the gingival tissues. When in doubt, the patient's mouth can be compared with photographic reproductions. The dentist should call to the attention of the patient any abnormal conditions, rather than wait until the patient points them out to him.

It is my sincere hope that the day is not far distant when every conscientious practicing dentist will demonstrate an active interest in maintaining complete dental health. In so doing he will justify the confidence and hope the public has placed in him, and by elevating its standards, be a credit to his profession.

—524 Weightman Building.

DYNAMIC IRRITATION AS A CAUSE OF PERIODONTAL DISEASE AND THE MEANS FOR ITS ELIMINATION

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In periodontal treatment it is necessary to differentiate between symptomatic and causal treatment. Although the knowledge and technic of treating symptoms is well advanced, causal treatment, the removal of the cause, seems not so well established, probably because in many instances the cause has not been properly determined.

There is little doubt that in the majority of cases more than one factor is responsible for the development and continuation of periodontal disorders. In some cases there is the possibility that one condition only may be the exciting agent.

Current Opinion

Occlusal trauma has been commonly accepted as one of the causes of some periodontal afflictions. There are differences of opinion as to the definition of this term, as indicated by the writings of various authors. Stillman and McCall[1] defined traumatic occlusion as "an abnormal occlusal stress which is capable of producing or has produced an injury to the dental or periodontal tissues." Box[2] differentiated between traumatogenic occlusion, that is, trauma-producing occlusion, and traumatic occlusion, which is the result of trauma. Furthermore, he divided traumatogenic occlusion into three groups: (1) primary traumatogenic occlusion is abnormal occlusal factors against normal periodontal factors; (2) secondary traumatogenic occlusion is normal occlusal factors against abnormal periodontal factors, and (3) abnormal occlusal factors against abnormal periodontal factors.[3]

Coolidge[4] and Miller[5] accepted the term "traumatic occlusion" as defined by Stillman and McCall. Although Stillman and McCall and Miller expressed the belief that horizontal loading and vertical loading are equally responsible for periodontal injury and that only the magnitude of the active force is of importance, Box[3] pointed out that stress in the vertical or axial direction is less damaging than stress in the horizontal direction. Coolidge[4] and Haupl and Lang[6] expressed the opinion that vertical stress is not injurious but is stimulating to the tooth supporting apparatus and that horizontal force results in pressure against the alveolar crest and the periodontal membrane, which may cause injury.

The question of how occlusal trauma is introduced has been answered as follows: Stillman and McCall[1] enumerated three conditions which singly or collectively will introduce traumatic occlusion:

Department of Applied Materia Medica and Therapeutics, College of Dentistry, University of Illinois.

1. Stillman, P. R., and McCall, J. O., *A Textbook of Clinical Periodontia*. New York: Macmillan Co., 1937.
2. Box, H. K., Traumatic Occlusion and Traumagenic Occlusion. *Oral Health* 20:642 (December) 1930.
3. Box, H. K., *Twelve Periodontal Studies*. Toronto, Canada: University of Toronto Press, 1940.
4. Coolidge, E. D., *Clinical Pathology and Treatment of the Dental Pulp and Periodontal Tissues*. Philadelphia: Lea and Febiger, 1946.
5. Miller, S. C., *Textbook of Periodontia*. Philadelphia: Blakiston Co., 1943, chap. 10.
6. Haupl, K., and Lang, F. I., *Marginal Periodontitis*. Berlin: Hermann Muesser, 1938.

1. Interference with the freedom of the oscillating movements of the mandible through abnormal relationship of one or more opposing occlusal inclined surfaces.

2. Occlusal stress delivered at an incorrect angle by the antagonizing teeth.

3. Supra-occlusion of a tooth as related to the line of occlusion, viz., elongation.

Box[3] stated, in regard to this problem, that traumatogenic occlusion may be introduced by "(1) excessive magnitude of the occlusal force, that is, interfering cusps; tooth elevation; (2) excessive angle of contact, that is, lack of wear; certain examples of excessive wear."

There is unanimity among all investigators in regard to the method of treatment. Occlusal and incisal grinding is universally recommended for the elimination of occlusal trauma. McCall expressed the belief that orthodontic treatment would be the ideal method of adjustment. In cases of extremely deep overbite he recommended opening of the bite with the aid of restorations in the molar and bicuspid regions.

Occlusal Trauma or Dynamic Irritation

Although the term "occlusal trauma" seems to be solidly established in the profession, it is questionable whether it is correct in its meaning and whether it encompasses the whole problem. Trauma means injury and, as commonly used, an injury rather suddenly inflicted by an external force. If a person would bite with full strength into an unexpected cherry stone, an injury or trauma could result. This trauma will manifest itself immediately. It has been produced as a result of the occlusion of the jaws. This result would be a real occlusal trauma.

The physiopathologic process described by the same term is entirely different. The forces involved are not applied suddenly in an extreme excess of their normal magnitude, and the damage does not become manifest immediately. It is not the magnitude of the force but the continuity of its action which produces the reaction of the investing tissue and causes its deterioration. Although it is a commonly accepted fact that deposits of calculus create injury to the periodontal apparatus, one would not speak about "traumatic calculus." It is known that the soft tissues of the periodontium are highly susceptible to irritations of such a constant nature. The calculus, as well as occlusal and other forces, under certain conditions causes irritation and not trauma.

The second part of the questionable term is "occlusal." Disregarding the fact that occlusion is used commonly as a static term, a brief review of some physiologic facts in regard to the development and stability of occlusion should be given. The occlusion of a given denture is the end product of heredity, function and environmental conditions. If all of those conditions are ideal, an ideal occlusion will result. An ideal occlusion is, unfortunately, a rare occurrence. All dentures are greatly formed and shaped by their function except in those cases in which heredity or extremely unfavorable environmental conditions cause serious malocclusion. Therefore, it is hard to believe that natural conditions will allow teeth to erupt into a position productive of excessive stress. It seems obvious that such a condition of excessive vertical stress can be produced only by artefacts, such as fillings or crowns.[4] Thus a situation is created which is capable of producing real trauma. Therefore all the experimental studies which have been performed with such restorations are not conclusive in regard to this problem.[2,7] It is not the occlusion, but the force exerted against the teeth involved, which is responsible for the irritation produced. A particular occlusion may create the possibility of producing damaging force, but whether or not damaging force will be produced depends entirely on the function of the masticatory muscles and on

7. Gottlieb, B., and Orban, B., *Die Veraenderungen der Gewebe bei Uebermaessiger Beanspruchung der Zaehne.* Leipzig: Georg Thieme, 1931.

the length of time during which those forces are active.

It has been established that force exerted against the teeth is capable of producing damage to the periodontal structures under certain conditions. Those forces have been connected exclusively with masticatory function. This concept must be broadened since in some cases there are damaging forces developed which are not derived from the masticatory muscles. The stability of both arches of the denture depends greatly on the retentive power of the muscles of the cheeks and particularly of the lips which encounter the forces developed within the oral cavity by the tongue. The tongue, on the other hand, supports the arches from within. The devastating effect of the lack of tongue support can be seen in patients who breathe through their mouths. Mouth breathing leads to a collapse of the arches combined with progressive protrusion of the front teeth. If balance between the retentive power of the lips and the force of the tongue is not present, forces will be exerted against the front teeth which lead to serious impairment of their periodontal health. Those facts justify the statement that the problem is not an occlusal but a dynamic one, since the forces which may endanger the periodontal health of teeth may be derived either from the action of the masticatory muscles or from the lack of balance between the muscles of the tongue, cheeks and lips. Therefore the term "dynamic irritation" may be used to encompass this physiopathologic problem.

Analyses of Force

There are two types of forces which act against the teeth and may cause dynamic irritation. They are: (1) forces developed by the muscles of mastication and (2) forces which are created by lack of balance between the outer and the inner part of the muscular framework surrounding the arches.

Every force acting against the teeth can be resolved into a vertical and a horizontal component. Vertical force within physiologic limits is not damaging or irritating but stimulating and, therefore, necessary for the maintenance of the health of the tooth supporting apparatus. This fact is indicated by the peculiar way in which the tooth is suspended in its alveolus mainly by the oblique fibers, which consist of coiled nonelastic fibrous tissue.[8] Vertical pressure stretches all those fibers and transforms the force into pull without irritation to the interstitial tissue and the blood vessels of the periodontal membrane. The opposite situation prevails in regard to the effect of lateral force. The number of fibers in resistance to lateral force is small. Almost the whole force is transmitted to the gingival and apical third of the periodontal membrane and the alveolar bone in the form of pressure, which results in irritation as it continues to occur.

Supporting evidence for this contention is given first of all by nature itself. The history of the human denture reveals that this important organ has been designed to remain intact and functional for the life span of a person.

Cameron's[9] study of the skeleton of British neolithic man confirms this statement. Cameron did not find, in all prehistoric skulls examined, a single case of alveolar resorption. In prehistoric man, early wear presenting flattened cusps and end-to-end bite in the incisor region was the rule.

In Campbell's[10] study of the dentures of the Australian aboriginal he stated that, in any series of Australian skulls of varying ages, the presence of the edge-to-edge bite is associated with the occlusal wear which the teeth have undergone.

8. Kronfeld, R. *Histopathology of the Teeth and Their Surrounding Structures*. Philadelphia: Lea and Febiger, 1939.

9. Cameron, B. G., *The Skeleton of the British Neolithic Man*. London: Williams and Norgate, Ltd., 1934.

10. Campbell, D. R., *Dentition and Palate of the Australian Aboriginal*. Adelaide, Australia: Hassel Press, 1925.

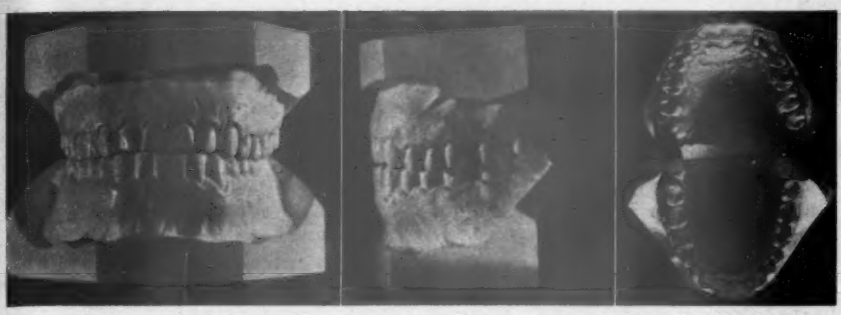

Fig. 1.—Plaster casts of a complete natural denture of a 65 year old man in excellent periodontal health

That is, a diminution of the cusp height of molars and bicuspids is accompanied by an apparent shifting forward of the lower anterior teeth relative to the upper anterior teeth. All those changes, also found in rare cases of modern human dentures, point to nature's endeavor to establish an occlusal relation which produces a maximum amount of vertical force and a minimum amount of lateral force during the function of the masticatory muscles. Furthermore, it reveals that there is a definite forward movement of the entire mandible, which may be caused by the forward swing of the mandible owing to the wear in the molar and bicuspid regions and by some continuous condylar growth. This forward movement of the mandible en masse is of great importance in regard to the introduction of dynamic irritation.

An excellent example of a human denture of an ideal type is shown in Figures 1 and 2. The complete denture, that of a 65 year old man, presents an ideal occlusion, immunity from caries and perfect periodontal health, with the exception of the upper molar region in which deposits of calculus have caused some irritation and bone resorption. The bite in the incisor region is slightly open as a result of excessive wear produced by the man's continuous use of a cigar holder for the past forty years. This case demonstrates that vertical stress, even in excess, does not cause dynamic irritation and periodontal destruction.

Other evidence that vertical stress does not produce irritation has been demonstrated by numerous cases in which a bite plane has been used continuously for one year or more in orthodontic treatment. The bite plane puts the whole load of masticatory force, except during actual mastication, on the six lower anterior teeth in an exact axial direction. No irritating effect has been observed in any one of the cases observed.

Summarizing these considerations, dynamic irritation is caused by excessive lateral forces exerted against the teeth. The damaging effect of these forces is not so much the consequence of the magnitude of the forces as it is the result of the continuity of their action. Therefore, it is necessary to determine how these lateral forces are developed and for what period of time they are active.

How Dynamic Irritation Is Introduced

Dynamic irritation by forces derived from the action of the muscles of mastication may be divided into the following groups, according to their introduction:

1. If molars or bicuspids fail to meet in the proper axial relation, the lingual surface of the lingual cusp of the upper tooth might be in contact with the buccal surface of the buccal cusp of the lower

tooth, thus developing a lateral force which will create dynamic irritation. 2. Improper axial inclination in regard to the occlusal plane caused by malocclusion or by tipping of teeth will be responsible for the development of lateral force. 3. Contact points must be considered as an essential part of the tooth supporting mechanism. Therefore, loss of contact as a result of malposition or the loss of an adjacent tooth will create in the tooth supporting system a point of lesser resistance at which any amount of lateral force becomes highly irritating.

All the conditions enumerated in these three groups are the consequence of malocclusion or incidental loss of teeth.

A fourth group concerns complete dentures with no serious malocclusion. The development of dynamic irritation through lateral force in these cases may be described as follows:

The denture demonstrated in Figures 1 and 2 has given evidence that nature has made provision to transform the juvenile human denture by wear so that the amount of lateral force developed by the action of the masticatory muscles remains within physiologic limits and thus is not irritating.

Lack of function, primarily because of the highly refined food of civilized man, probably is responsible for failure of the adult denture to mature. Cusp interference and incisal overbite persist, giving rise to the development of lateral forces under certain conditions.

As long as the lateral forces are balanced by natural tissue resistance, no damage occurs, but mesial drift, particularly the mesial movement of the mandible en masse, will lead to the increased development of lateral force and consequently to dynamic irritation.

There arises now the important question, "By what action of the masticatory muscles are those irritating lateral forces developed?" The obvious answer seems to be—during mastication. But this is not the case. If the masticatory function was

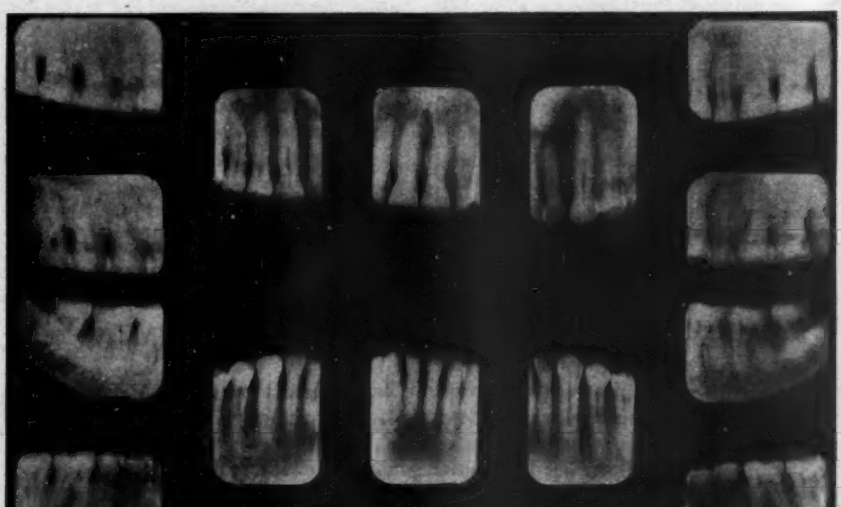

Fig. 2.—Roentgenograms of denture shown in Figure 1

of such intensity that proper wear would occur, the condition would not exist. Furthermore, the bolus of food interposed between the articulating teeth represents a cushion which acts as a bumper and takes away a great part of the impact. Except during actual mastication, the mandible remains in physiologic rest position and the teeth articulate only when the person swallows or experiences great physical or mental stress. The nightly activity of the masticatory apparatus seems to be much greater and much more important than has been assumed. Since the observation of the behavior of persons during their sleep is extremely difficult, the only way to ascertain the damage caused by nightly activity was to eliminate contact of the teeth. The elimination of any contact between the teeth of the upper and the lower arch during night has been so effective that the nightly activity of the masticatory apparatus is established as responsible for much of the dynamic irritation inflicted on the periodontal apparatus. The mandibular movement during sleep is basically different from the masticatory pattern. The force involved is relatively great and prolonged and is directed facially. This finding may explain the fact that in cases of this type the anterior teeth are the first ones involved and in the molar and bicuspid regions pockets develop at the mesial or distal side, that is, in the area of the greatest push or compression.

The development of irritating lateral forces is clearly shown in instances in which the muscles of the cheeks and lips are too weak to balance the pressure of the tongue and thus become the source of lateral force directed primarily against the anterior teeth. These forces are almost uninterrupted in action, a fact which may explain the spectacular damage which is caused by this type of dynamic irritation. This unbalanced muscular condition exists even prior to the eruption of the teeth. Consequently one may assume that its damaging effect should become evident as soon as the permanent denture has fully erupted. This effect can be observed in cases of extreme lack of balance. There the force developed becomes evident immediately after termination of the period of growth, during which tissue resistance seems to be high. Cases of this type, which may be called the primary type, are found in the teen-age group, predominantly in women because of their weaker muscular structure, and are commonly diagnosed as alveolar atrophy. One such case will be presented later. In cases in which the degree of lack of muscle balance is lesser, the normal tissue resistance may equalize the force for a long period of time. The force becomes damaging only if the tooth supporting apparatus has been weakened by some other causative agent so that lateral force hitherto tolerable becomes an irritating agent (secondary type).

Elimination of Dynamic Irritation

Dynamic irritation of these types has been found to be one of the causes of pathologic conditions of the periodontium. In order that proper causal treatment may be introduced, dynamic irritation must be recognized. Various methods for overcoming dynamic irritation have been designed and have been used successfully. These types are described as follows:

Group A.—This group includes cases of dynamic irritation resulting from cuspal interference and deep overbite. Cusp interference is eliminated by the well known methods of selective grinding as described in detail by Box[2] and Miller.[5] Thus the operator performs what nature itself performs in ideal dentures by the proper function of the masticatory apparatus and creates the gliding articulation which produces a minimum amount of lateral stress.

The elimination of the damaging effect of incisal overbite is essentially different and is a much more difficult

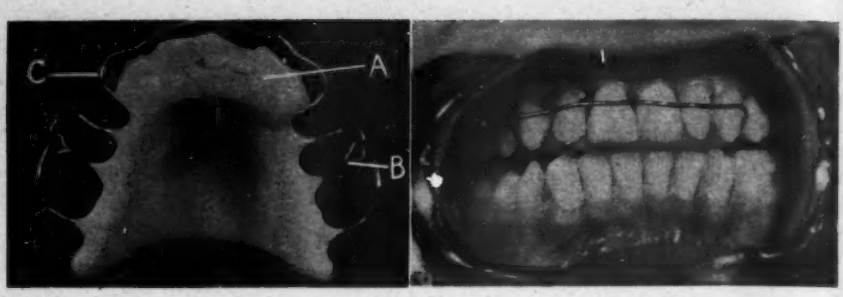

Fig. 3.—Left: Bite plane. A, bite wall; B, arrow clasp; C, anterior wire. Right: Bite plane placed in the mouth. Note that the six lower anterior teeth only are in occlusion with the bite plane

problem since the anterior teeth in this stage of their maturation do not possess occlusal surfaces, which would prevent their elevation after their height has been reduced by grinding. Neustadt[11] pointed out the difference between tooth eruption and tooth elevation. He stated that "the tendency to elevate belongs to every tooth, and the elevation is operative until certain resistance is encountered. Then the elevation force is inhibited from becoming operative again on the removal of the occlusal impediment." Consequently the expectation that a correct protrusive occlusion between the upper and lower anterior teeth will prevent the lower teeth from elevating into their original relation does not seem to be justified. For the same reason, the placing of restorations in the molar and bicuspid regions would fail to open the bite since the lower anterior teeth would elevate into their former relation. This procedure is not only unsuccessful but also damaging because the crown-root relation in the molar and bicuspid regions, if the clinical crown has been artificially increased in length, becomes unfavorable for the tooth supporting apparatus.

Therefore, the raising of the bite has been accomplished by the use of the bite plane, which utilizes the ability of the teeth to elevate. The appliance[12] consists of a full palatal plate which has a bite wall from cuspid to cuspid (Fig. 3). This bite wall has to be brought into articulation with the six lower anterior teeth in such a way that those teeth strike the plane exactly perpendicular. The rest of the lower teeth, all molars and bicuspids, are without opposing occlusion when the mandible moves to occlude. The vertical height of the bite plane is to be limited to such an extent that some free way space from physiologic rest position to contact with the plane still remains.

All plates used in this experiment were equipped with arrow clasps, which secure retention of the plate, and with a labial wire embracing the anterior teeth from cuspid to cuspid to secure their retention in their original position (Fig. 3). This appliance is worn uninterruptedly for a period of three to six months. During this time it is removed only during meals, to allow free and sufficient mastication, and for the purpose of cleaning.

The use of the appliance permits the elevation of the posterior teeth, which have been deprived of their occlusal resistance. The elevation takes place almost exclusively in the mandibular arch. After some time has elapsed, all molars and bicuspids have elevated in a group along

11. Neustadt, E., Tooth Elevation Versus Tooth Eruption. *D. Items Interest* 57:489 (June); 585 (July); 699 (August) 1935.

12. Schwartz, A. M., *Gebissregelung mit Platten*. Vienna, Austria: Urban & Schwarzenberg, 1938.

with the alveolar process. Thus there is no increase in the length of the crown. This elevation produces an opening of the bite. With one exception, elevation occurred in all persons treated. The bite was opened within three to six months so far that the overbite was reduced to a minimum, and in centric occlusion there was a free space of 2 to 3 mm. between the upper and lower incisors and cuspids.

In order to secure the retention of this altered bite, the plate must be worn indefinitely during the night.

The use of the bite plane is not restricted to patients whose bite has to be opened. It has been used to eliminate dynamic irritation derived from the activity of the masticatory muscles during the night. The use of the bite plane is not contraindicated by periodontal afflictions of the lower incisor and cuspid regions as long as these teeth remain functional. The bite plane provides stimulating function for the lower anterior teeth and has brought definite improvement in respect to their solidity.

Group B.—This group includes cases in which dynamic irritation resulted from lack of balance of the muscles of the tongue, lips and cheeks. In this group the problem is different, and therapeutic measures in those cases must follow different lines. After treatment of all periodontal symptoms, perfect mouth hygiene has to be established. Hopelessly involved teeth should be extracted. Teeth which have migrated should be brought into their original position by adequate orthodontic means, and continuous retention should be provided until the muscle exercises have strengthened the outer band of muscles to a considerable extent. The exercises consist of extension and contraction of the orbicularis oris muscle with and without resistance. This exercise must be practiced three times a day, twenty to fifty exercises each time. After the muscles have gained sufficient strength, wearing of the retentive appliance may be restricted to the night.

The methods outlined have been applied to more than 30 cases of periodontal involvements of various degrees in which dynamic irritation has been found to be an outstanding cause. The degree of periodontal destruction which those patients had at the beginning of the treatment covered a wide range. In some cases the first symptoms of active dynamic irritation were found; other patients had deep periodontal pockets and alveolar resorption to the limit at which treatment still offered a chance to keep the teeth functional for some period of time. In all cases beneficial effect of the treatment has been observed. For every patient who has been subjected to treatment by appliance, the following routine steps have been performed: (1) careful scaling of all teeth, (2) extraction of hopelessly involved teeth, (3) introduction of proper technic of brushing teeth and mouth hygiene, (4) treatment of all symptoms of acute inflammation until they subsided and (5) conservative treatment of periodontal pockets and finally elimination by surgical or chemical methods. Thus the oral cavity was made sanitary.

The success of the treatment which followed these steps is shown by the markedly reduced mobility of the teeth involved and by the fact that there was no recurrence of any symptom indicating the existence of further dynamic irritation.

Case Reports

Three typical cases illustrating these results follow. Two of the patients have been under steady observation for more than five years. The third case illustrates the immediate effect of this type of treatment, within a period of ten months.

The selection of cases was based on the following conditions: Dynamic irritation should be the major exciting condition for the existence of the periodontal condition. The case should be typical for one particular clinical group as previously outlined. The amount of periodontal

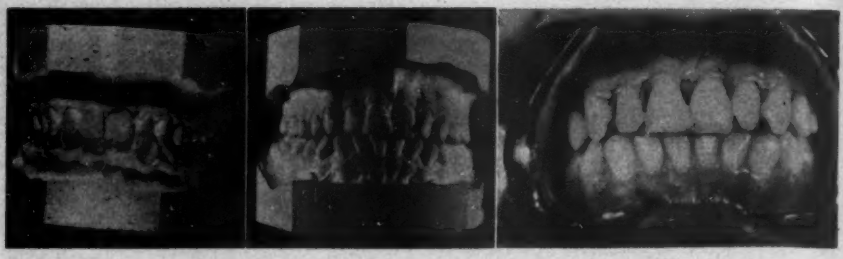

Fig. 4 (case 1).—Left: Before treatment. Center: One year after treatment was begun. Right: Five years and eight months after treatment was begun

damage should be close to the limits at which treatment could be successful since the milder cases would give inconclusive results.

Case 1.—A woman, 24 years of age, in good general health, had been suffering from gingival irritation and progressive loosening of the four upper incisors for the past two years. The condition was diagnosed as periodontosis, and various treatments had been administered without evidence of success.

Examination.—The patient had her complete denture. There was little formation of subgingival calculus in the molar region. Class I malocclusion was present. The upper and lower incisors, which were rotated, were crowded, and deep overbite with tight incisal contact was present. The cusps in the molar and bicuspid regions showed little wear. The gums did not show any acute symptoms of inflammation but were lacking in firmness. Only in the upper incisor region were the gums slightly swollen, particularly around both central incisors, where pockets 3 mm. deep at the labial side and 5 mm. deep at the lingual side were found (Figs. 4 and 5). The central incisors presented considerable mobility, and the lateral incisors showed little mobility. The roentgenograms reveal alveolar resorption around the central incisors, where the bone was reduced to almost a third of its original height (Fig. 6). Light resorption of the alveolar crest was present in the molar region.

This case represents the typical picture in which the physiologic forward movement of the mandible is blocked by the deep overbite. The brunt of the force developed in this way is exerted against the upper incisor teeth, since the lower incisors holding the inner line are in a much better position.

Treatment.—After treatment of all symptoms as outlined and the institution of proper mouth hygiene, the following treatment was introduced. Cusp interference in the molar and bicuspid regions was eliminated by selective grinding. In order to remove the dynamic irritation caused by the close contact of the upper and lower anterior teeth, a bite plane was constructed. The patient wore this appliance day and night, except during meals and during cleaning of the teeth, for a period of five months. Within this time the molars and bicuspids elevated to such an extent that the bite was opened 3 mm. in the incisor region. Consequently, the lateral forces which had caused the irritation of the supporting

Fig. 5 (case 1).—Left: Incisal relation before treatment. Center: Incisal relation five years and eight months after treatment was begun. Right: Occlusal view before treatment

structures in this region were eliminated. After a five month period had elapsed, the patient was told to wear the appliance only at night.

At the time when the proper relation in the anterior region was established, the condition of all teeth was greatly improved (Fig. 5). Both upper lateral incisors were solidly in place, and the upper central incisors showed a slight degree of mobility. Further treatment was restricted to regular scaling to remove a minimum amount of subgingival calculus that formed within six months in the molar and bicuspid regions. Full mouth roentgenograms were taken at intervals of eight to ten months.

After five years and eight months of treatment, the gum tissues are firm and normal throughout the entire denture, the gingival crevice is extremely shallow and the surface shows well hornified epithelium (Figs. 4 and 5). The extent of the bite opening is the same as it was five years ago. All teeth are firm with the exception of both central incisors, which are slightly mobile. This mobility is much less than would be indicated by the roentgenographic findings. The patient has no complaints. Roentgenograms taken before treatment show that resorption was active in the alveolar bone in the upper incisor region (Fig. 6), and the roentgenograms most recently taken reveal that the alveolar bone in the same region is well consolidated and sharply outlined (Fig. 7).

Case 2.—The second case selected for presentation belongs in the same group as case 1, but it is complicated by the extension of the irritation over the entire denture as a result of severe malocclusion and the loss of three teeth.

A woman, 29 years of age, in good general health, had suffered from general oral discomfort for ten years and had been treated repeatedly and extensively without any permanent success. Regular scaling and therapeutic treatment during the past two years had been performed.

Examination.—Class II, division 1, malocclusion, with an extremely deep overbite, was present. There was little wear of the cusps in the molar and bicuspid regions. Contacts were broken by the drifting of teeth as a result of the extraction of the two lower second bicuspids and the upper left second bicuspid (Fig. 8). All teeth were slightly mobile, particularly both of the lower first bicuspids,

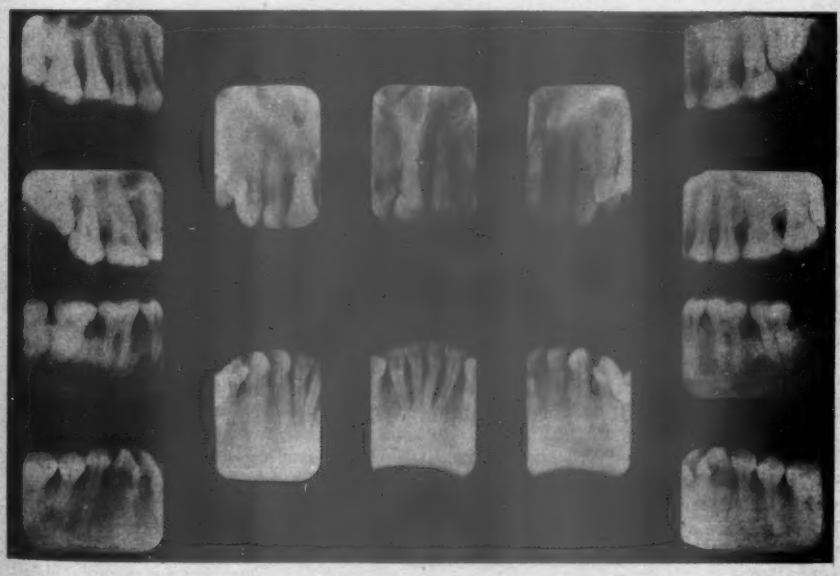

Fig. 6: (case 1).—Roentgenograms taken before treatment

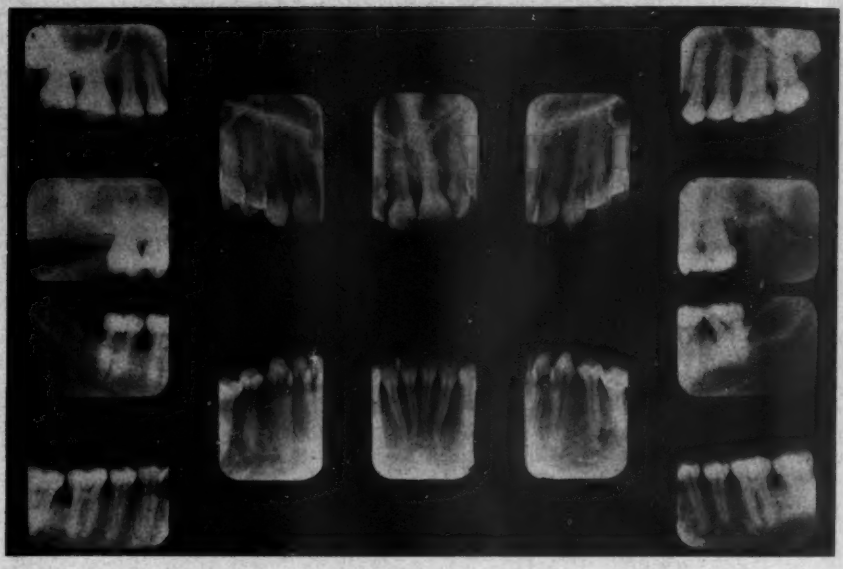

Fig. 7 (case 1).—Roentgenograms taken five years and eight months after treatment was begun

which had reached the limits of mobility for successful treatment. In the lower anterior region and the upper and lower bicuspid regions the gums were slightly inflamed and edematous. Deposits of calculus were present in moderate amounts. Periodontal pockets, 3 to 4 mm. deep, were found around the upper right first bicuspid and lateral incisor, the upper left first bicuspid, the lower right central incisor and first bicuspid and the lower left lateral incisor, cuspid and first bicuspid. The roentgenographic findings corresponded to the clinical picture (Fig. 9). Extensive alveolar resorption was found around both lower first bicuspids and the lower left lateral incisor. Considerable resorption of the alveolar bone was present throughout the entire denture.

The principal cause of this condition seemed to be dynamic irritation resulting from malocclusion complicated by the change of axial inclination and broken contacts resulting from loss of teeth. The extremely deep overbite which locked the mandible in its most retrusive position seemed to be an outstanding condition in the development of lateral force in the facial direction.

Treatment.—For a period of eight weeks the preliminary routine treatment, consisting of scaling, irrigation and the elimination of pockets, was performed. Satisfactory technic of brushing the teeth was introduced. After the mouth had been placed in a sanitary condition, a bite plane was constructed and was inserted with the usual instructions for continuous wearing except during meals and during brushing of the teeth.

Of special interest in this case is the rapidity with which the mandible changed its closing position from retrusive to centric position. At the same time the elevation of the molars and bicuspids progressed with unusual rapidity. Six weeks after the bite plane was inserted, the bite was opened 2 mm. The same excellent progress was observed in regard to the tightening of all teeth. At the end of six months the bite had been opened to such an extent that the patient was given instructions to wear the plate only at night. The gum tissues were in normal condition, and the mobility of the teeth either had disappeared or had been decreased to a minimum.

The most interesting feature of this case is the spontaneous change of the position of the mandible, which moved facially almost a quarter of an inch without the application

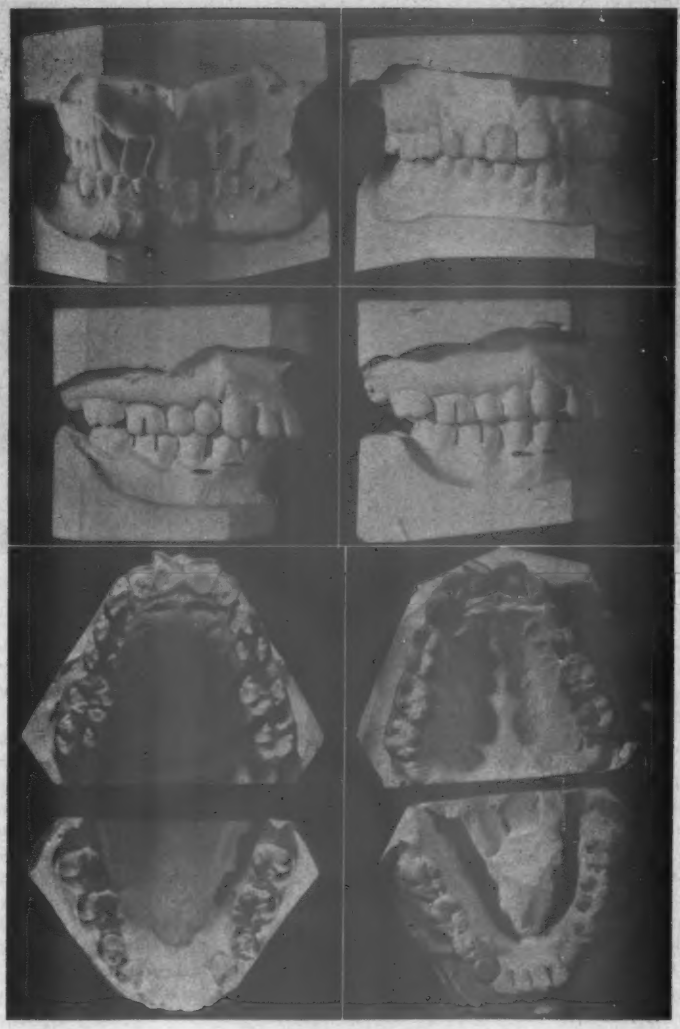

Fig. 8 (case 2).—Left: Before treatment. Right: Ten months after treatment was begun

of any pulling force. The change must have occurred in the temporomandibular joint, indicating that the mandible was locked in the extreme retrusive position by this type of malocclusion. The rapid forward movement of the mandible as soon as the locking device was removed by the bite plane gives evidence of the inherent force in the movement of the mandible in a facial direction which is responsible for the damage.

A comparison between study models taken at the time that the bite plane was inserted and ten months later reveals the following changes (Fig. 8). The bite had opened 4 mm.

Fig. 9 (case 2).—Roentgenograms taken before treatment was begun

The mandible had moved facially 4 mm. The difference in the relation of the cuspid and first bicuspid to the plane of occlusion has been reduced greatly. At the same time it can be observed that the gingival line of the bicuspid has risen to the same extent, indicating that no elongation of the clinical crown occurred. The roentgenographic findings at this time do not reveal any conspicuous change in either direction (Fig. 10). Such changes cannot be expected since the consolidation of bone tissues involved takes place some time after the movement of teeth has been accomplished. During the last three months the patient has worn the bite plane only at night. The gingival tissues and the gingival crevice around all teeth are normal. The mobility of the teeth has been reduced greatly. The two lower first bicuspids and the lower left lateral incisor are slightly loose as are the lower molars, and the entire upper arch has become solid.

Case 3.—A woman, 19 years of age, in perfect general health, complained that during the past two and a half years diastemas had formed in the upper and lower anterior regions, and at the same time she had observed that the teeth were becoming increasingly loose. The condition had been diagnosed as alveolar atrophy, and treatment had been attempted without any effect.

Examination.—The patient had a complete denture with the third molars not yet erupted. Class I malocclusion was present. The arches were wide, and good wear was evident in the molar and bicuspid regions (Fig. 11). The upper and lower incisor regions were protruding, and a diastema of a quarter of an inch was found between the central incisors in both arches. Both lower central incisors and the lower right lateral incisor were extremely mobile and had suppurating pockets reaching almost to their apexes. The upper left central incisor was mobile to a lesser degree, and the right central incisor was only slightly mobile. Both teeth showed suppurating pockets, 3 to 5 mm. in depth. The only other tooth presenting some periodontal involvement was the upper left first molar, which had pockets 6 mm. deep on the lingual, mesial and distal sides and was loose. Deposits of calculus were not present. There were no restorations. The roentgenographic findings confirmed the clinical picture (Fig. 12). In the region of the upper central incisors there was considerable resorption of the alveolar bone. The lower left lateral incisor and both lower central incisors

Fig. 10 (case 2).—Roentgenograms taken ten months after treatment was begun

were almost entirely deprived of their alveolar support and were hopelessly involved. Of the rest of the teeth, only the upper left first molar showed extensive resorption of the alveolar bone.

This denture presented all the requirements for excellent periodontal conditions—good general health, no calculus, no caries and no restorations. The basic occlusion was almost ideal, and good function was indicated by the excellent wear. There was only one point in which nature had failed: The balance between the muscular forces of the tongue, lips and cheeks was missing. The patient had an extremely heavy and bulky tongue, in contrast to which the muscles of the cheeks and particularly those of the lips were almost without tone. This discrepancy is the exclusive cause of the periodontal condition of such gravity. The diagnosis was primary dynamic irritation, Group B.

Treatment.—The lower right lateral and central incisors and the left central incisor were removed, since they were hopelessly involved. The periodontal pockets around the upper central incisors and the upper left first molar were treated and eradicated. The condition of the molar was serious, but it was decided to treat and conserve the tooth as long as possible in order to postpone the construction of a bridge until all orthodontic procedures had been completed. Proper mouth hygiene was introduced. It was necessary to restore the normal axial inclination of the upper incisors and to eliminate the lateral force derived from the lack of retentive power of the muscles of the lips. Muscle exercises were introduced. In order to move the anterior teeth lingually to their original position, removable plate appliances[12] were used with high labial front springs for the movement. Lateral arrow clasps were employed for retention. In this way the force of the wire balanced the forces exerted by the tongue and eliminated the source of further dynamic irritation.

The effect of the treatment gives evidence that the diagnosis was correct. Within eight months the lingual movement of the anterior teeth had been completed. The extracted lower teeth were replaced with a partial denture, which acted at the same time as a retainer for the lower arch. In the upper arch the active appliance was replaced by an inactive retainer, which was worn for a period of three years, until the muscles of cheeks and lips were strong enough to allow the patient to

dispense with the retainer except at night.

At present the protrusion of the anterior teeth has been corrected (Fig. 11). Normal contact is present in the entire upper and lower arch, with the exception of the lower right cuspid and the lower left lateral incisor. These teeth are out of contact in order to accommodate the mesiodistal clasps of the partial denture which replaced the extracted lower right lateral incisors and the left central incisor. The upper left central incisor is slightly mobile. The condition of the upper left first molar has deteriorated, and the extraction and replacement of the tooth by a bridge is planned for the near future. The rest of the teeth are tight.

The roentgenogram reveals that no further damage has occurred to the periodontal tissues around the teeth which were already involved at the beginning of the treatment except the upper left first molar (Fig. 13).

These 3 cases have been presented as typical examples of their respective groups. They have one feature in common. The attempt was made to retain and keep functional some teeth which were so seriously involved that successful treatment seemed to be doubtful unless complete elimination of the major exciting conditions could be accomplished. The fact that the teeth thus involved were saved for a period of more than five years is evidence in support of the theory that dynamic irritation is responsible for

Fig. 11 (case 3).—Upper left: Before treatment. Upper right: Five years after treatment was begun. Lower left and center: Before treatment. Lower right: Five years after treatment was begun

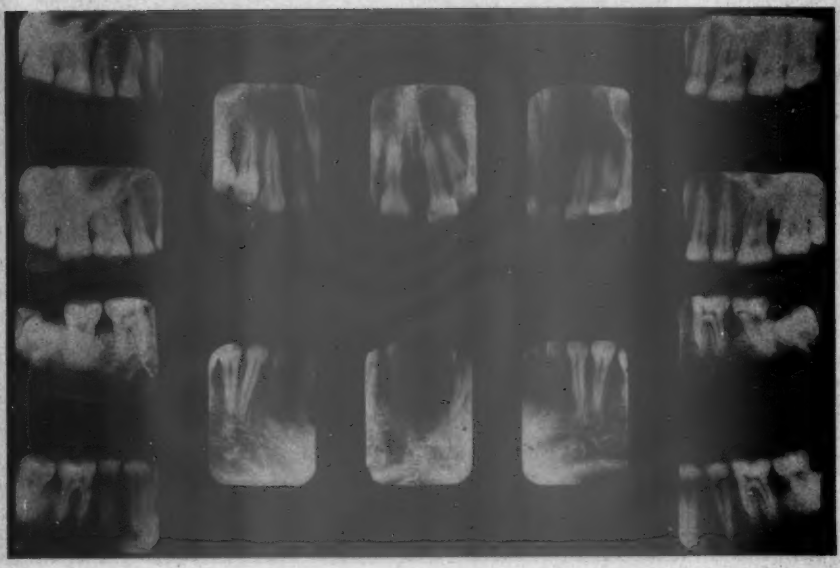

Fig. 12 (case 3).—Roentgenograms taken before treatment

periodontal damage of this character and that the methods designed for its elimination are adequate and correct.

Summary

The term "traumatic occlusion" or "traumatogenic occlusion" should be replaced by the term "dynamic irritation," since the damaging effect to the periodontal structures does not have the character of a traumatic injury nor is it caused by some definite type of occlusion. The damage to the periodontal tissues is the effect of a force active for a long period of time. It is a chronic irritation. Since forces which are not related to occlusion constitute the source of this irritation, the term "dynamic irritation" seems to be correct in its meaning and encompasses the entire physiopathologic problem.

Vertical force within physiologic limits, that is, force parallel to the long axis of a tooth, is not irritating but stimulating and contributes to the health of the normal tooth supporting apparatus. Lateral force causes dynamic irritation.

There are two sources for the development of lateral force: the muscles of mastication, and the lack of balance between the retentive power of muscles of cheeks and lips and the force derived from the muscles of the tongue.

Dynamic irritation resulting from the action of the masticatory muscles may be introduced by malposition of opposing teeth, improper axial inclination, loss of contact points and failure of the denture to mature so that cuspal interference and incisal overbite persist. A change in occlusion as a result of the mesial movement of the mandible is primarily responsible for the development of excessive lateral force.

Lateral forces causing dynamic irritation are not developed during actual mastication but during the action of the masticatory muscles during sleep when they are out of control.

Lack of balance between the muscles of the tongue and the muscles of the

Fig. 13 (case 3).—Roentgenograms taken five years after treatment was begun

cheeks and lips causes continuous development of lateral force. Therefore, the effect is extremely serious and damage to the periodontal tissues progresses rapidly.

In addition to the routine treatment of periodontal afflictions, consisting of scaling, irrigation and later elimination of pockets and institution of appropriate mouth hygiene, the dynamic irritation, if present, is to be eliminated by the following methods:

In the case of dynamic irritation caused by cuspal interference and deep overbite, the following methods should be used: 1. Selective grinding of occlusal surfaces in the molar and bicuspid region is accomplished. 2. In order to eliminate incisal contact and deep overbite, the bite is opened as an orthodontic procedure with the aid of a bite plane. After the bite is opened to the desired extent, the bite plane is worn continuously at night only as a retainer and in order to eliminate any noxious effect of the nightly activity of the masticatory muscles.

In the case of dynamic irritation caused by lack of balance of muscles of the tongue, lips and cheeks, the following methods should be used: 1. Teeth which have migrated are brought back into their normal position and axial inclination by appropriate removable orthodontic plate appliances. 2. Muscle exercises are introduced in order to strengthen the muscles of the lips and cheeks. 3. After the necessary movement of teeth has been successfully performed, the teeth are held under continuous retention, which can be reduced as the strengthening of the muscles of lips and cheeks progresses.

Clinical cases have been presented with records giving evidence that the methods applied and the underlying theoretical considerations are correct.—*808 South Wood Street.*

THE PERIODONTAL STRUCTURES AND REMOVABLE PARTIAL DENTURE PROSTHESIS

Irving Glickman, D.M.D., Boston

THE field of partial denture prosthesis may be divided into two mutually dependent phases, a restoration phase which is concerned with the design, construction and maintenance of prosthetic appliances and a tissue phase which entails the response of the supporting tissues to partial prosthesis. In individual cases the restoration of masticatory efficiency by partial dentures is essential for the maintenance of periodontal health. Nevertheless, partial dentures constructed without regard for resultant responses in the periodontal tissues produce pathologic changes which seriously detract from their ultimate value. Because the materials, design and construction of the periodontal tissues have been provided by nature, this aspect of the partial denture problem has not been favored with the study which has gone into technical developments in man-made restorations. It is the purpose of this paper to analyze the principles underlying the reactions of the periodontal tissues to removable partial denture prosthesis.

Function

Because removable partial dentures exert external forces on the alveolar bone, either through tooth-borne or tissue-borne sections or both, they set up within the bone internal resistant forces which are called "stresses."

The adaptability of alveolar bone to external forces and the influence of internal stresses on bone architecture warrant discussion. The internal architecture of alveolar bone and the height of the bony structure in relation to the roots of the teeth are determined by a microscopic equilibrium between bone formation and bone resorption. Osteoblasts and osteoclasts are the cells which participate in the bone equilibrium. The osteoblasts are associated with bone formation and the osteoclasts with bone resorption. These cells function in close proximity to each other in three key zones in the alveolar bone: (1) adjacent to the periodontal membrane, (2) adjacent to the oral mucoperiosteum and (3) along the endosteal margins of the medullary spaces. Whenever alveolar bone is called on to withstand a change in the intensity or direction of external forces, it is in these three key regions that changes in the morphologic character of the bone are effected.

In common with the remainder of the skeletal system alveolar bone is dependent on functional stimulation for the preservation of its structure.[1] In addition, the individual bony trabeculae of alveolar bone are oriented along the lines of principal stress in an effort to obtain the maximum resistance to external forces with a minimum of material.[2] The removal of all external forces has a fatal influence on alveolar bone structure. It bears repetition that the adaptability of alveolar bone to external forces is made possible by the constantly present microscopic activity of the osteoblasts and osteoclasts previously described.

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Associate professor of oral pathology, Tufts College Dental School.

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This subservience of alveolar bone to local functional forces is constantly subject to systemic regulation. Study of material obtained at autopsy[3] and animal experiments[4] have shown that at any one time the status of the microscopic equilibrium which governs the structure of alveolar bone or the relation between bone formation and bone resorption is the same in the jaws as it is throughout the remainder of the skeletal system. The status of the bony equilibrium is a variable dependent on the physiologic and pathologic processes of the entire body for its regulation. When, as the result of a systemic disturbance, the microscopic equilibrium in the remainder of the skeletal system is shifted in favor of resorption, a similar condition prevails in the alveolar bone, too, and loss of alveolar bone occurs regardless of the condition of the gingival tissues or the structural details of prosthetic restorations.

The constantly present systemic regulation of alveolar bone constitutes the "bone factor" which is a fundamental consideration in the construction of all dental prosthesis because it governs the capacity of alveolar bone to adapt itself to functional demands. Old age, malnutrition and postmenopausal changes[5] are examples of common systemic conditions which, because they inhibit the individual formative capacity of bone, favor atrophic changes in bone throughout the skeletal system and thereby have a direct bearing on the capacity of alveolar bone to withstand external forces. Not only does the bone factor regulate the cellular activity which makes it possible for alveolar bone to accommodate existing functional requirements but it also determines the adaptive capacity of alveolar bone to increased functional demands.

The interdependence of alveolar bone and the periodontal membrane and functional stimulation is corroborated by reports of autopsy studies describing an increase in bone trabeculae in the cancellous bone adjoining teeth in function in contrast with a reduction in the bone trabeculae surrounding teeth devoid of antagonists.[6] The finding of a poorly developed periodontal tissue almost devoid of bundles of principal fibers around nonfunctioning teeth also attests to the dependence of the periodontal structures on functional stimulation.[7] The adaptability of the periodontal membrane and alveolar bone to increased functional demand is supported by the description of hypertrophied periodontal fibers and dense alveolar bone around single teeth bearing the entire masticatory force. On an experimental basis, Stones[8] produced sclerosis of bone in the form of several layers of highly calcified tissues, in addition to bone resorption, as reactions to increased external load. The favorable conditions observed roentgenographically around single molars which bear the brunt of increased masticatory load are constant reminders of the adaptability of the supporting tissues to increased functional demands.[9]

Destructive Changes

In considering removable partial prostheses as sources of external force on the periodontal tissues, the following factors are significant: the direction of the force, its distribution, frequency of occurrence and amount. The principal fibers of the periodontal membrane are

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so arranged as best to meet forces directed along the long axis of the tooth. With axial overloading there is compression of the apical periodontal fibers, lacunar resorption of apical bone and tension on the periodontal fibers around the remainder of the root.[7] The tension stimulates bone deposition in the surrounding alveolar bone.[10] The histologic demonstration of bone resorption under tension of the periodontal fibers by Lefkowitz and Waugh[11] is in disagreement with the more generalized acceptance of tension as a stimulus to bone formation. The design of occlusal rests is an important factor in directing the external forces of partial prosthesis along the long axis of the teeth. The suggestions that the lug rests be seated in spoon-shaped preparations in the abutment teeth with the floor inclined so that the deepest point is toward the long axis of the tooth[12] or that horizontal lug rests be made to extend beyond the central zone of the occlusal surface of bicuspids or over one root in the molars[13] are in accordance with the concept which points to a relative attractiveness of axial stress.[14]

Under normal conditions of function, lateral forces on teeth are accommodated by bone formation and resorption around the root surface distributed in relation to the fulcrum which is approximately a third of the way from the apex of the clinical root. Excessive lateral stress accentuates the normal resorption in the compression areas[15] and produces bone loss. The most disadvantageous point of application of lateral force is near the occlusal line because the increased fulcrum length accentuates the compression in the underlying bone.

Torques or rotational forces set up a combination of changes in the periodontal tissues.[16] In the regions of tension new bone is formed. In regions of pressure, compression and necrosis associated with resorption of bone and tooth occur. In the latter instances the bone bordering the periodontal membrane is lost, and an attempt is made to compensate for this loss by the formation of new bone in the medullary spaces. It is apparent that if the local bone-building capacity is inhibited because of alterations in the bone factor, the compensatory bone formation which is attempted in regions of torsion will be inhibited and the destructive effect exaggerated. According to Adler,[17] partial dentures exert a dislodging or turning force on abutment teeth which varies in magnitude depending on the attachment mechanism.

It is apparent, in view of the autopsy and experimental evidence previously referred to, that compared with the effects of stresses in the lateral or rotary directions, the changes associated with axial stress offer the least potential harm. In fact, normal axial stresses stimulate bone formation adjacent to the lateral surfaces of the root.

Frequency of occurrence modifies the reaction of alveolar bone to external forces. Constant pressure on bone causes resorption, whereas intermittent force favors bone formation, as reported by Leriche[1] (page 101) and Murray[2] (page 163). The time lapse between pressure applications apparently influences the bone response. Jores[18] suggested twenty-four hours as a favorable interval between the applications of pressure in

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order to stimulate bone formation. He also noted that recurrent forces over short intervals of time have essentially the same resorbing effect as constant pressure.

Considerable emphasis has been placed on the effect of increasing external forces on teeth with the resultant traumatic changes in the periodontal tissues. Hemorrhage, thrombosis, hyaline degeneration and necrosis of the periodontal membrane, with excessive bone resorption, root resorption and fracture of cementum from the root surface have been described in autopsy studies associated with excessive force on teeth.[19] It is noteworthy that on an experimental basis such destructive changes arise principally from increased lateral forces. Permanent looseness such as occurs in periodontal disease could not be produced by increasing the force on teeth in any direction.[20] The finding of Stones, previously referred to, that both bone resorption and bone formation may result from increased functional forces and the experiments of Hemmens and Harrison,[21] in which it was not possible to produce loss of alveolar bone by adding to tooth load, discourage unqualified acceptance of a simple "cause and effect" relationship between increasing functional stresses and destruction of the supporting tissues. Because the effect of increased forces on teeth is measured in terms of cellular changes which are in turn regulated by the individual's systemic background, the assertion of Orban[22] that "the whole question of traumatic occlusion is not local, but a question of the physical condition of the individual" is understandable.

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20. Bodecker, C. F., Critical Review of Gottlieb and Orban's "Die Veränderungen der Gewebe bei Uebermaessiger Beanspruchung der Zähne." *Internat. J. Orthodont., Oral Surg. & Radiog.* 18:895 (September) 1932.

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Specific Relationships

The specific relationships which exist between removable partial prosthesis and periodontal disease warrant discussion. Judiciously used, partial denture prosthesis helps maintain the health of the periodontal tissues and prevents the onset and progress of some forms of periodontal disease. By replacing missing teeth, the partial denture prevents mesial and distal drifting and associated lateral forces, food impaction and pocket formation. Elongation of teeth where such a tendency exists also is prevented by partial denture replacements. By distributing the load of mastication, particularly in those patients in whom most of the remaining teeth are in the anterior portion of the mouth, partial denture prosthesis minimizes the disturbances which result from increased lateral forces. By restoring masticatory efficiency throughout the mouth, partial dentures promote the benefits which the gingivae and supporting tissues derive from function and reduce the likelihood of periodontal disease observed when teeth are out of function.[7] The use of partial dentures in selected cases for stabilizing teeth involved with periodontal disease is generally recognized. When supporting bone is lost, forces of mastication which normally exert a favorable influence on the underlying bone may become destructive influences because of altered leverage relationships resulting from an increase in the clinical crown. The limitation of the movement of such teeth by partial dentures often reduces the stresses in the underlying bone to a level which not only is well tolerated but also is favorable to bone formative activity. The microscopic evidence of the cellular repair of the supporting tissues after destructive traumatic forces have been relieved[19] encourages the use of partial dentures as periodontal splints.

It is not necessary to mention that in all cases of periodontal disease the path-

ologic conditions should be eliminated before partial dentures are constructed. This is necessary in order to determine the relative usefulness of teeth for abutments and to remove any factors which may hinder the retention of teeth after the insertion of the partial prosthesis. It should also be noted that the existence of periodontal disease discourages proper chewing habits and the necessary mastication of food because of (1) excessive tooth mobility, (2) pain associated with the impaction of food in the periodontal pockets and (3) actual inability of degenerated periodontal fibers and osteoporotic bone to withstand even normal functional stresses.[23] The insertion of partial dentures in a mouth with untreated periodontal disease hardly can be expected to afford the gratification of successful function.

It is also advisable to minimize lateral stresses in the natural dentition previous to the insertion of partial dentures. Although the adaptive mechanism of alveolar bone to increased function is recognized, the unfavorable nature of lateral stress as compared with axial stress makes alleviation of the former desirable.

It should be emphasized that bone loss may continue under the saddle areas in cases of periodontoclasia even after the teeth have been extracted. This is so in cases in which the periodontal destruction is predominantly the result of an inherent tendency to bone loss. For this reason the saddle areas of partial dentures in cases of periodontoclasia may require constant readaptation to the tissues. Attention to this detail will reduce the harmful effects which result from the settling of partial dentures in the saddle areas.

Unsatisfactory Results

Partial denture prosthesis, of considerable potential benefit to the periodontal tissues, inadvertently may contribute to the initiation and progress of periodontal disease. Resorption of bone under the distal end of unilaterally supported saddles is often responsible for the distal tilting of abutment teeth with resultant food impaction and pocket formation along the mesial aspect of the abutment tooth. The use of multiple abutments, indirect retention or stress breakers may serve to minimize this untoward sequel.

Insufficient saddle coverage is responsible for torsional stresses around abutment teeth with destructive changes which may lead to tooth mobility.

Recurrent gingival enlargements and gingival inflammation are common findings in cases in which the tissue-borne portion of a partial denture is finished with an escalloped border with finger-like extensions between the teeth. Pocket formation is encouraged when partial dentures are so constructed that the peripheral margins bordering the teeth terminate in a blunt thick border. The trough thus formed by the tooth and thick denture margin allows the impaction of food. In order to prevent marginal gingival inflammation and food impaction in relation to the saddle areas of partial dentures, two possibilities are offered: first, that the saddle be brought up from the oral mucosa onto the tooth and over the cingulum, thereby protecting the gingival sulcus and also serving as indirect retention; second, that the tissue-borne portion of the denture terminate about 3 mm. away from the necks of the teeth in a fine edge rather than a blunt margin. The latter procedure stimulates the marginal gingiva by facilitating the normal functional excursion of food.

Attempts to increase the interalveolar distance by using only the tissue-borne areas of partial dentures generally are rewarded by results exactly opposite to the original intention. This occurs more frequently with lingual bars without distal molar abutments. Rapid resorption of bone under such saddle areas is followed

23. O'Rourke, J. T., Personal communication to the author.

by tilting of the abutment teeth, closing of the bite, distal movement of the lower anterior teeth along the inclined planes of the maxillary incisors, distal drifting of the entire mandible and labial migration of the upper anterior teeth.

An attempt sometimes is made to justify the construction of partial dentures without lug rests in those instances in which the periodontal condition around the remaining teeth does not warrant axial load. The settling of such dentures stimulates pathologic periodontal changes which are comparatively more harmful than those which might result from the added stimulus of axial stress on the teeth.

Because it is generally advisable to utilize some form of restoration in abutment teeth that support partial dentures, the preparation of such teeth in so far as it involves the gingival sulcus warrants analysis. Preparations in abutment teeth should not extend below the base of the gingival sulcus. It is understandable that even in the most careful preparation in the cervical region, portions of the gingival margin may be removed. In such instances the marginal gingiva tends to regenerate and restore the pre-existent level of attachment of the gingival sulcus (page 263),[13] provided the preparation has not been made to extend beyond this level. In the latter instance the gingival epithelium will proliferate in an apical direction and attach itself below the margin of the preparation, so that recession and the initial stages of pocket formation result.

The question arises as to the manner in which gingival inflammation and pocket formation, which may result from partial prosthesis, impair the serviceability of partial dentures. Inflammatory changes in the gingiva produce degeneration of the periodontal membrane and resorption of alveolar bone so that neither the periodontal membrane nor the bone is capable of continued adaptation to the existent functional demands. The effect of inflammation on the underlying bone varies in different persons and often in the same person at different times. It cannot, therefore, be presumed that in different persons gingival inflammation of similar severity and duration will produce comparable bone destruction. When periodontal disease occurs in patients with partial dentures, stresses which were previously well tolerated or which may have acted as stimuli for strengthening the periodontal structures automatically may become destructive influences. The combined effects of gingival inflammation and destructive tendencies induced by partial dentures result in tooth mobility.

Summary

Function is a prerequisite for the maintenance of alveolar bone. The internal architecture of alveolar bone is guided by the direction of external forces on it. Alveolar bone is capable of adaptation to increased functional demands.

In addition to a subservience to functional changes, the maintenance and adaptability of alveolar bone is constantly subject to a systemic regulatory mechanism known as the "bone factor."

Destructive changes occur in the supporting tissues associated with increased forces on the teeth. Severest changes arise from increased lateral or rotational stresses. Axial overloading is comparatively well tolerated.

Partial denture prosthesis contributes to periodontal health by preventing the migration of teeth, by establishing generalized masticatory efficiency and by stabilizing mobile teeth.

A partial denture prosthesis which is designed improperly may inadvertently contribute to periodontal disease by accentuating lateral and rotational stresses and by fostering food impaction, gingival inflammation, pocket formation and tooth mobility.—*483 Beacon Street.*

VINCENT'S INFECTION: EXPERIMENTAL REPRODUCTION OF LESIONS AND THE ROLE OF STREPTOCOCCI

Herbert M. Cobe, Ph.D., Philadelphia

THERE is still considerable confusion as to the etiologic role of the so-called symbiotic organisms of Vincent's infection. Since the disease was first described the bacteriologic diagnosis has been in complete confusion, and little of the experimental work has been consistent and conclusive. In fact, those who have reported on Vincent's infection have not been able to agree on nomenclature, predisposing factors, occurrence or the clinical and bacteriologic correlation.

This paper comprises a review of some of the earlier historical work and a discussion of the experimental work conducted over a period of years in this laboratory. The main body of the experimental work emphasizes the etiologic role of the oral streptococci and the experimental use of animal inoculation to reproduce ulcers of various types which are similar to, if not identical with, those found in cases of ulceromembraneous gingivitis and stomatitis. The work is not complete, and there are many related matters which are still to be investigated. As a preliminary report, this paper will illustrate the possibility of following Koch's postulates in establishing the roles of the suspected causative agents.

The constant combination of a typical spirochete and a fusiform bacillus in the nose and throat of patients was described in 1894 by Plaut[1] and in 1896 by Vincent.[2] Since then there have been numerous concepts of the mechanism producing this disease. Much stress has been placed in recent years on the so-called predisposing factors, cultural methods and symbiotic relation of the organisms found in the mouths of patients.

Nomenclature

Vincent's angina is, as the name implies, an inflammation of the throat. It usually is restricted to the tonsils, pharynx and soft palate and is characterized by the formation of a pseudomembrane. When the same symptoms are restricted to the tooth sockets, the interproximal spaces, the gingiva, and in severe cases, the tongue and buccal surfaces, the condition is known by various names. Among these are: Vincent's stomatitis; ulceromembraneous gingivitis, the name suggested some years ago by Grieves;[3] acute necrotic gingivitis, as it was called by Miller and Greenhut,[4] and, popularly, trench mouth.

There always has been confusion among students of oral bacteriology as

From the Department of Bacteriology, School of Dentistry, Temple University.

1. Plaut, H. C., Studien zur bacteriellen Diagnostik der Diphtherie und der Anginen. *Deutsche med. Wchnschr.* 20:900 (December 6) 1894.
2. Vincent, H., Sur l'Étiologie et sur les Lésions Anatomo-Pathologiques de la Pourriture d'Hopital. *Ann. Inst. Pasteur* 10:488 (September) 1896.
3. Grieves, C. J., Ulcero-membraneous Gingivitis, the Gingival Phase of Vincent's Disease. *D. Cosmos* 61:819 (September) 1919.
4. Miller, S. C., and Greenhut, W. M., Acute Necrotic Gingivitis (Vincent's Infection); Seasonal and Age Relations. *J.A.D.A.* 31:910 (July) 1944.

to the role which different bacteria play in specific mouth lesions. The constant presence of the organisms Fusiformis dentium and Borrelia vincenti in typical lesions has led to the belief that they are the causative factors in Vincent's disease, but as reported by the Research Commission of the American Dental Association,[5] there is no clear proof that these are the causative agents.

Early Methods of Study

Prior to the development of successful cultural methods, it was necessary to depend on the use of smears for our study. Stained preparations were used in the study of the form, structure and general characteristics of the organisms, and fresh preparations were used with the darkfield microscope for determining motility.

Ratios

Smears which were made daily from infected patients showed that in the acute and primary stages F. dentium is the predominating organism, with Bor. vincenti present to a lesser extent. As treatment progresses the fusiform bacilli are found in decreasing numbers, and in chronic cases of ulceromembraneous gingivitis the borrelia predominates. Treatment has been based on the assumption that these organisms are strict anaerobes, but the fact that the use of oxidizing agents in treatment causes F. dentium to decrease more rapidly than Bor. vincenti indicates that the former is the stricter anaerobe. This observation has been supported culturally.

Bacteriologic Diagnosis

The mere presence of the fusiform bacillus and a spirochete does not constitute a positive diagnosis of Vincent's infection. The fusiform bacilli and several kinds of spirochetes normally are present in the mouth. A study of more than 1,500 smears taken by three independent observers, without regard for existing oral conditions, from patients in hospital wards, dispensaries and private practice showed essentially the same results as 500 smears taken from so-called normal mouths of students. In 86 per cent of all smears taken, the combination of these organisms was found in sufficient quantities to make possible a bacterial diagnosis of ulceromembraneous gingivitis even though in 49 per cent of these patients there were no clinical symptoms. Stafne[6] found a slightly higher percentage of positive results. Lufkin and Disraeli[7] prepared smears from more than 1,000 persons taken at random. Smears from the mouths which showed clinical symptoms gave 96 per cent positive results whereas the mouths exhibiting no clinical symptoms gave 48 per cent positive smears. Kerr[8] stated that more than 90 per cent of the adult population have Vincent's organisms in their mouths continuously.

Bergey's[9] classification of the spirochetes of the mouth is the standard and the one accepted by the American Society of Bacteriologists. In describing the Bor. vincenti he says that it "occurs in association with the so-called fusiform bacillus in Vincent's angina and allied infections." Kritschevsky and Séguin[10] believed that this disease may be caused by any of the oral spirochetes in combination and that it is not due to any specific one such as Bor. vincenti. There is, however, no conclusive experimental evidence to confirm their observations.

5. Vincent's Infection: A Report by a Committee of the Research Commission. *J.A.D.A.* 32:756 (June 1) 1945.

6. Stafne, E. C., Spirochaetaceae and Fusiformis Dentium in the Mouth. *D. Cosmos* 70:493 (May) 1928.

7. Lufkin, A. W., and Disraeli, T., Vincent's Infection (Trench Mouth). *Pacific D. Gaz.* 37:611 (October) 1929.

8. Kerr, D. A., Gingival and Periodontal Disease. *J.A.D.A.* 32:31 (January 1) 1945.

9. Bergey, D. H., and Others, *Bergey's Manual of Determinative Bacteriology*. Baltimore: The Williams & Wilkins Company, 1939 (fifth edition).

10. Kritschevsky, B., and Séguin, P., The Unity of Spirochetoses of the Mouth. *D. Cosmos.* 66:511 (May) 1924.

Microscopic Appearance

Much information can be obtained from fresh, unstained preparations used with the darkfield microscope. This method as Hampp[11] has pointed out, causes fewer alterations in the form of bacteria than do the staining methods. The degree and type of motility are significant factors in the classification of organisms of the mouth. Two types of fusiform bacilli are found constantly in the oral tissues and pseudomembranes of patients with ulceromembraneous gingivitis. The larger organism is F. dentium and the smaller is probably Fusobacterium polymorphum. This latter organism is a rod 0.2 to 0.5 by 8 to 12 microns with pointed ends and often occurring in filaments. It is extremely sluggish, and motility often is absent. Both bacteria are highly pleomorphic, varying in size and degree of curvature from a large straight tapered rod to a small, hooked, almost banana-shaped organism.

According to Appleton,[12] the term "fusiform bacillus" gives little information except regarding the form, and cultural methods are necessary for further identification. In serum mediums and in other mediums rich in nitrogen such as Holman's cooked meat medium, F. dentium may be seen growing end to end in pairs simulating jointed molds. With a simple aniline dye such as 2 per cent methyl violet, these bacteria are seen to contain granules which take a deeper stain than the ectoplasm and often give the organisms an appearance of banding or striping.

Granules

F. dentium is seen in all stages of granular content ranging from homogeneously filled pods to those showing only an occasional granule. Under the darkfield microscope it frequently is observed that these granules are cast out from the organisms. If the procedure is a purposeful one, it is not a regular one. Observations made at intervals of fifteen minutes showed that by the end of eighteen hours all of the granules had been emptied from a single full bacillus, but there appeared to be no regularity in the timing of extrusion. It is thought that these granules cannot be spores or related bodies because alterations in the environment have no effect on the process, whereas spore formation characteristically is affected by such changes. The hydrogen ion concentration, carbohydrate content, temperature and oxygen tension all were varied, and the procedure was neither hastened nor retarded. From our observations it is evident that these granules are not spores or spore-like bodies and that although they appear to be associated with metabolism or growth their extrusion from the cell is variable and unregulated. They have the general appearance of glycogen granules and may be associated with carbohydrate metabolism.

It has been suggested by Tunnicliff[13] that the spirochetes associated with F. dentium are stages in its life cycle and that these granules possibly may be germinal centers. Smith[14] found that in old cultures of the fusiform bacilli, and in those grown under an increased carbon dioxide tension, the organisms changed into a semispiral form. This seems to support the thought of Tunnicliff. Hartman[15] assumes that the fusiform bacillus is the invading organism and the borrelia an accessory factor, which does not seem to be borne out by the results of our experimental inoculations. The consensus at present is that Hartman's idea has little foundation. Further investigation

11. Hampp, E. G., Comparative Study of Dark-Field and Stained Smear Technics for Identification of Oral Spirochetes on the Basis of Morphologic Characteristics. *J.A.D.A.* 32:318 (March 1) 1945.
12. Appleton, J. L. T., Jr., *Bacterial Infection.* Philadelphia: Lea & Febiger, 1944 (third edition).
13. Tunnicliff, Ruth, The Identity of Fusiform Bacilli and Spirilla. *J. Infect. Dis.* 3:148 (March 2) 1906.
14. Smith, David, *Oral Spirochetes and Related Organisms in Fuso-Spirochetal Disease.* Baltimore: The Williams & Wilkins Company, 1932.
15. Hartman, H. A., The Present Day Concept of Vincent's Infection. *D. Digest.* 51:498 (August) 1945.

of the nature of these granules from a chemicophysical point of view is being carried out.

Types of Oral Spirochetes

Three types of oral spirochetes constantly were observed, and on several occasions a fourth type could be demonstrated. This last type is exceedingly active and so much shorter than the others that in behavior and appearance it is more like a vibro than a spirochete. The other three types are the ones which were described by Noguchi;[16] namely, the Treponema microdentium, which is about 0.25 microns thick and has from 12 to 14 curves; the Treponema macrodentium, which is about 1.0 micron thick and has from 2 to 8 curves, and the Bor. vincenti, which is about 0.3 microns thick and has 4 to 12 curves.

The motility of spirochetes is variable, the borrelia being the most motile. The organisms which are found in the early stages of ulceromembraneous gingivitis or stomatitis are more active than those found at the termination of an infection. When the interproximal spaces of the teeth or the tonsillar crypts are involved, the borrelias present are more actively motile than the treponemas found in the same places. The spirochetes tend to lose their motility after treatment of the patient, but even then they remain more actively motile than the same type of organisms found in patients who are noninfected or who at least show no clinical symptoms.

Culture in Vitro

Cultures of mouth organisms have been grown most successfully on Krumwiede medium[17] or on a liver infusion agar, either anaerobically or under reduced oxygen tension. No difficulty was experienced in isolating a large and a small fusiform bacillus.

Spirochetes were isolated from active cases, particularly from the pseudomembranes, and pure cultures were grown on glucose liver-infusion agar. Test tubes were filled with the agar to a depth of 10 cm. and a well-like depression was made with a smaller test tube. This hollow was filled with a saline suspension of the exudate. Growth appeared as a white flaky or feathery growth beginning at the center and extending laterally to the sides of the tube.

Cultures of the fusiform bacillus and the spirochete in combination were carried through successive transplants, and they often were accompanied by a green or viridans type of streptococcus. Cultivation under oil was as successful in yielding pure cultures as was cultivation in tubes placed in a Spaulding or Brewer's anaerobic jar. The pH was found to be important, and optimum results were obtained within a pH range of 6.8 to 7.0. No cultures showed any growth in less than forty-eight hours.

Culture medium was placed in open Petri dishes and was inoculated with material from ulcers or pseudomembranes which showed a high percentage of F. dentium and Bor. vincenti as well as different combinations of aerobic organisms such as Bacillus subtilis and various staphylococci. When smears produced cultures of F. dentium and Bor. vincenti with few or no aerobic organisms, the medium was inoculated with cultures of staphylococci and B. subtilis as supplementary organisms. The presence of the aerobic bacteria served to keep the anaerobic organisms alive for a longer period of time than they otherwise would have lived, but continued subcultures from these various mixtures repeatedly were negative. Blood plates grown anaerobically gave consistently negative results for anaerobic organisms, although at one time a large vibrio was isolated. It was carried

16. Noguchi, Hideyo, Cultural Studies on Mouth Spirochaetae (Treponema Microdentium and Macrodentium). *J. Exper. Med.* 15:81 (January 1) 1912.

17. Krumwiede, Charles, Jr., and Pratt, Josephine, Fusiform Bacilli. Isolation and Cultivation. *J. Infect. Dis.* 12:199 (March) 1913.

through six generations but lost its motility after the fifth generation.

Smith,[14] in reporting the bacteriology of Vincent's infection, noted four types of organisms: a large spirillum (probably the Spirillum sputigenum of Miller),[18] two types of fusiform bacilli and a vibrio. The usual mouth aerobes also were found. Smith isolated all of the anaerobes including the vibrio in pure culture. He also isolated anaerobic streptococci which he believed to be nonspecific, and which were not always associated with the existing lesion.

Streptococci

In almost all of the cultures which were taken from the interproximal spaces of the teeth or from the gingival margins of persons with Vincent's infection, the presence of a facultative or strictly anaerobic streptococcus was noted. Special attention was paid to these streptococci, inasmuch as I was able subsequently to support Smith's work wherein he found that typical abscesses could not be reproduced by means of animal inoculation unless a streptococcus was present. In the classification of the streptococci found, the Streptococcus salivarius of Holman[19] was the most frequent and persistent member of the group found on culture (Table 1).

Table 1.—Incidence of streptococci isolated from 500 patients with Vincent's infection

Organism	Patients	Per cent
Str. salivarius	350	70
Str. equinus	100	20
Str. nonhemolyticus II (Holman's classification)	40	8
No streptococci found	10	2

Molds

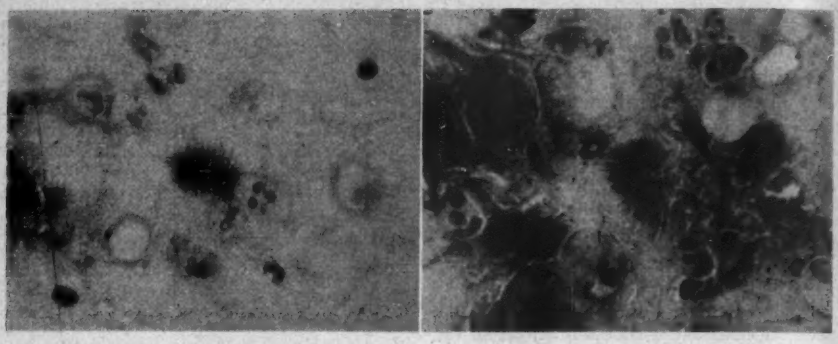
Molds are the most common contaminant and probably have some influence in producing anaerobic conditions and low oxygen supply. Von Beust[20] first reported in 1905 that the organism causing Vincent's infection was a fungus called Leptothrix falciformis. He believed that the fusiform bacillus was the spore form of this mold. In specifically stained preparations using iron alum-hematoxylin, he showed a typically feather-like arrangement of these spores around a mycelium or hypha. They were identical morphologically with the fusiform bacillus. By following the technic prescribed by Von Beust, the exact picture described by him was reproduced (see illustration, left). His elaborate staining technic was thought necessary to show the attachment of the spores to the stalk. However, the same figures are demonstrable in smears taken from the lesions in acute cases and stained with simple aniline dyes such as 2 per cent methyl violet (illustration, right).

These spores were seen only in direct smears. Molds found on cultures were isolated, but none of them could be identified as Leptothrix whereas the common Streptothrix was easily isolated. Growth was profuse in serum water, but it never yielded a sporulating stage even when environmental factors such as pH and oxygen tension were changed. If there is some definite relation between the molds found in these cases and the cause of Vincent's infection, I never have been able to demonstrate it, although I am of the opinion that there may be some effect of a symbiotic or synergistic nature which needs further investigation.

Inoculation of Animals

Animal experimentation with the associated organisms found in these lesions produced interesting results. Smith[14] pro-

18. Miller, W. D., *The Micro-Organisms of the Human Mouth*. Philadelphia: The S. S. White Dental Mfg. Co., 1890.
19. Holman, W. L., The Classification of Streptococci. *J. M. Res.* 34:377 (July) 1916.
20. Von Beust, Theo, Beitrag zur allgemeinen Morphologie der Mikroorganismen des Mundes. *Arch f. Zahnheilk.* No. 5, p. 3, 1906.



Left: Smear showing Leptothrix falciformis, stained by the Von Beust method. Right: L. falciformis from an acute case of Vincent's infection, stained with 2 per cent methyl violet

duced experimental lesions in rabbits by inoculation of different combinations of the fusiform and spirochetal organisms, and we were able to verify these results with some variations. I found, as described by Rosebury,[21] that guinea pigs are not susceptible to peroral inoculation, nor could we produce an infection on the intact conjunctiva of rabbits. With cultures taken from peritonsillar membranes or from ulcerous pockets in the gingiva and cultured aerobically and anaerobically, two distinct types of colonies were obtained: (1) a pure fusiform bacillus and (2) a mixed fusiform bacillus and spirochete. By use of solid mediums, pure cultures of both fusiform bacilli and spirochetes finally were obtained. The same organisms were found by repeated culture. The anaerobic streptococcus also was isolated in pure culture on blood plates.

21. Rosebury, Theodor, Recent Developments in Fusospirochetal and Related Infections. *J. Periodont.* 17:121 (July) 1946.

Table 2.—Abscess formation in guinea pigs

Organisms	Character of abscess
Streptococcus, anaerobic or aerobic, pure culture	Simple abscess, often cellulitis, pus moderate
F. dentium	Inflammatory reaction, occasional mild slough
F. dentium and Bor. vincenti	No true abscess, marked necrosis and sloughing, pus watery

Different combinations of all the organisms isolated were injected into the inguinal region of guinea pigs, and abscess formation was noted. The results of these experiments are summarized in Table 2.

The lesions caused by the streptococcus alone were abscesses characterized by swelling, redness, and often cellulitis with a thick viscid purulent exudate. These became walled off, and some of them drained spontaneously. There were no characteristic odors. The abscess or ulcer-like lesion produced by F. dentium in pure culture (if true abscess formation occurred) was an indurated hard mass with varying degrees of necrosis, a small amount of slough and no odor. With the mixture of F. dentium and Bor. vincenti there was an abundance of purulent material, marked necrosis and a pseudocaseation of the inguinal nodes.

Other organisms were mixed with Bor. vincenti and F. dentium in various combinations, using a predominance of one organism or the other. These were injected into the inguinal region of test

animals. Streptococci, either alone or in combination with other aerobes, such as staphylococci and pneumococci, produced in every case an ulcer similar to the ulcerous lesions found in the gingiva. Pus formation, which is characteristic of this type of pyogenic organism, was marked. The odor was foul and fetid. Caseation of the lymph nodes was prominent, and a great deal of sloughing of a superficial type took place. At times even sloughing of overlying skin and hair was observed, together with external drainage of purulent material.

The material which was aspirated from the groin of the guinea pigs was mixed with a small amount of physiologic salt solution and from 0.25 cc. to 1.5 cc. of the suspension was inoculated intratracheally into adult rabbits and guinea pigs. After inoculation the animals were held in an upright position in order to be sure that the purulent material would flow into the bronchial tree and to the dependent portions of the lungs. After two weeks a radiopaque solution was injected in the same manner and roentgenograms were made of the lung fields. This examination was repeated at weekly intervals, and after twelve weeks the animals were killed and the organisms from the lungs and bronchi or bronchiectatic cavities were recultured. The results of this procedure with five rabbits and two guinea pigs are shown in Table 3.

A bronchiectatic cavity which was filled with pus containing the injected organisms plus a nonhemolytic streptococcus, innumerable pneumococci and Staphylococcus aureus developed in rabbit 4. The pathologic picture of true Vincent's infection is one of inflammation with varying degrees of ulceration and sloughing. The types of lesions produced in the lung fields were all directly de-

Table 3.—Results of intratracheal inoculation of animals with material from lesions produced in the inguinal region of guinea pigs by oral bacteria from human beings

Animal	Original source of organisms	Organisms	Results
Rabbit 1	Pharyngeal pseudomembrane	Str. salivarius	Pneumonia
Rabbit 2	Gingivitis	F. dentium	Pneumonia
Rabbit 3	Palatal ulcer	F. dentium Bor. vincenti Nonhemolytic streptococcus	Lung abscess and gangrene
Rabbit 4	Peritonsillar pseudomembrane	F. dentium Str. salivarius	Bronchiectasis and necrosis in one lobe
Rabbit 5	Pseudomembrane from anterior pillar of left tonsil	F. dentium Bor. vincenti Str. salivarius Str. equinus	Multiple bronchiectasis
Guinea pig 1	Pseudomembrane from throat	F. dentium Bor. vincenti Str. salivarius	Bronchiectasis
Guinea pig 2	Gingivitis	F. dentium	No pathologic condition

pendent on the kinds of organisms used.

From the results of this experimentation it was felt that the role of the streptococcus (either anaerobic or aerobic) in any case of Vincent's infection is an important one, and that pathologic pulmonary conditions can be produced experimentally with the various symbiotic combinations.

Summary

The combination of F. dentium and Bor. vincenti is the causative agent in ulceromembraneous gingivitis.

Positive smears, sufficient to justify a bacteriologic diagnosis of ulceromembraneous gingivitis or stomatitis, have been obtained from 86 per cent of all patients taken at random and without regard to the clinical condition of the mouth. The clinical picture of gingivitis or periodontal disease, or other clinical signs, in addition to the bacteriologic diagnosis, are necessary before a positive diagnosis can be made.

The role of oral molds is not clearly defined, but they should not be dismissed as incidental contamination. Possibly they should be regarded as symbiotic agents which are capable of maintaining a lowered oxygen level.

Animal experimentation with various organisms in combination with F. dentium; F. dentium and Bor. vincenti; and F. dentium, Bor. vincenti and streptococci produced various types of abscesses in guinea pigs.

Pulmonary lesions, except those of pneumonia, could not be reproduced experimentally without including a streptococcus. Typical bronchiectasis, lung abscess and gangrene were produced by combinations of streptococci and other organisms isolated from the lesions of Vincent's infection.

Public Health Programs.—I suggest that to a very marked extent public health work is being reoriented by forces quite outside itself; that society is exerting ever-increasing pressure for new and expanding activities that relate to the public health: pressures for expansion and formalizations in mental hygiene, hospitalization, medical care, the hygiene of housing, research. Some of these undertakings require sound organization, wise administration, and proper coordination with already existing health work and with each other. In all of them it is imperative that those who participate possess high professional qualifications. The demand that these things be incorporated in public health programs is very strong, and if the public health agencies are unwilling to accept their proper share of responsibilities in these areas, then other agencies, possibly ill-suited, will attempt to meet the need. I suggest that neither a nostalgia for the simpler days of public health work nor a disapproval of some of the implications in a changing social order is sufficient ground for refusing to meet this responsibility. In the public interest, a decision as to what part we shall play should be based upon reason and a sense of reality rather than upon an emotional reaction.—*Harry S. Mustard, "The Stems and Roots of Public Health Practice," Am. J. Pub. Health 37:1513, December 1947.*

CONSTITUTIONAL FACTORS PREDISPOSING TO PERIODONTAL DISEASE: CASE REPORT OF PRIMARY ALVEOLAR BONE ATROPHY IN A DOG

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CONSTITUTION has been defined as "that aggregate of inherited characters modified more or less by environment which together determine the individual's reaction, successful or unsuccessful, to the stress of environment."[1] Constitution in this broad sense is concerned in great part with genetics.

The influence of the genes on body build has been studied extensively. Sheldon[2] has divided human beings into three major groups or somatotypes, the endomorphic, the mesomorphic and the ectomorphic. The endomorphic person is one in whom the digestive system seems to predominate, the mesomorphic person is athletic and muscular and the ectomorphic person is slender and delicate.

Significance of Body Type

Certainly the dental profession should be interested in knowing whether there is a correlation between body type and dental findings. The characteristics of the teeth, their arrangement in the dental arches and the quality of their soft and bony tissue attachments, as well as the predisposition to dental disease should be ascertained for each of these groups. It seems possible that the mesomorphic person with his heavy musculature and bony tissues would have periodontal attachment tissues of comparable development, but this is purely conjecture.

This problem of correlation between body type and dental findings is complicated by the fact that each person is a blend of types and that complex anthropometric data are required for classification. Furthermore, starvation changes people from other classifications to the ectomorphic type, which raises the question of how fundamental these classifications actually are. However, with return to normal food habits, individuals tend to regain rapidly their previous body measurements. Unfortunately the data for a report on the effect of hereditary factors on the development of periodontal disease are almost wholly lacking. Therefore, one is obliged to turn his attention to factors less fundamental than heredity which modify in a systemic way the "individual's reaction, successful or unsuccessful, to the stress of environment."

Origin of Periodontal Disease

Talbot[3] described periodontal disease as a local inflammatory condition of the gums in which "two great types of causes play a part; the exciting and the predisposing causes." He said, "The exciting causes may be purely local, or may be local expressions of constitutional

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1. Draper, George, *Human Constitution*. Philadelphia: W. B. Saunders Co., 1924.

2. Sheldon, W. H., *The Varieties of Human Physique*. New York: Harper & Brothers, 1940.

3. Talbot, E. S., *Interstitial Gingivitis or So-Called Pyorrhoea Alveolaris*. Philadelphia: The S. S. White Dental Manufacturing Co., 1899, p. 12.

states." Heredity, rickets, scurvy, diabetes and mercurial poisoning were among the constitutional factors discussed.

Hopewell-Smith[4] was so deeply impressed with changes in the bony attachment tissues of teeth in human material examined at autopsy that he made the statement, "Pyorrhea alveolaris does not begin as a gingivitis. It is essentially dependent upon an osseous lesion, an atrophy of the bone." This extreme view was counterbalanced by the opinion of James and Counsell,[5] also based on examination of autopsy material. They stated bluntly, "Our work supports the view that the primary lesion is of local origin."

Gottlieb[6] took an intermediate stand. He believed that in the vast majority of instances periodontal disease is of local origin. In such cases, removal of local factors such as calculus, overhanging fillings, impacted food and excessive occlusal forces is sufficient to allow a return to normal. In a relatively small percentage of cases, however, the primary lesion was described as a diffuse alveolar bone atrophy and the local development of pockets was a late complication of the process.

Glickman and Wood[7] compared the changes in alveolar bone with changes found in the remainder of the jaws and in the ribs and vertebrae. They found that the predominant tendency toward formation or resorption of bone that is exhibited in regions adjacent to the periodontal membrane is paralleled simultaneously in other parts of the jaw and in other regions of the skeletal system. This important observation has been extended and corroborated by animal experiments concerning the effect of starvation[8] and of diabetes induced by alloxan.[9]

Effect of Endocrines

Goldman[10] has studied the effect of hyperthyroidism on the alveolar bone. In experimental animals (guinea pigs) there is a greatly accelerated rate of bone resorption and new formation with resorption in the ascendency so that widening of the periodontal membranes and loosening of the teeth result.

Schour[11] has reported changes in the periodontal tissues of hypophysectomized albino rats. He[12] has shown also that overactivity of the parathyroid gland causes rarefaction of the alveolar bone with cyst formation, changes similar to those found in other parts of the skeletal system. There is little doubt that additional information concerning the interrelations of the endocrine glands and the osseous structures will become available with further clinical and experimental studies.

Effect of Vitamins

The vitamins are similar in some respects to the endocrines. In each instance, extremely small amounts of specific chemical substances exert a profound influence on metabolic processes. The vitamins differ from the endocrines in that the former must be obtained from the environment, usually through the food intake. The exception is vitamin D, which may be obtained from sunlight or other sources of ultraviolet light. Much has been written concerning the role of

4. Hopewell-Smith, A., Pyorrhea Alveolaris—Its Patho-Histology. *D. Cosmos* 53:397 (April) 1911.

5. James, W. W., and Counsell, Arthur, A Histological Investigation into "So-Called Pyorrhoea Alveolaris." *Brit. D. J.* 48:1237 (October 15) 1927.

6. Gottlieb, Bernhard, Tissue Changes in Pyorrhea. *J.A.D.A.* 14:2178 (December) 1927.

7. Glickman, Irving, and Wood, Harold, Bone Histology in Periodontal Disease. *J. D. Res.* 21:35 (February) 1942.

8. Glickman, Irving; Morse, Anna, and Robinson, Leonard, The Systemic Influence Upon Bone in Periodontoclasia. *J.A.D.A.* 31:1435 (November 1) 1944.

9. Glickman, Irving, The Periodontal Structures in Experimental Diabetes. *New York J. Den.* 16:226 (June, July) 1946.

10. Goldman, H. M., *Periodontia.* St. Louis: The C. V. Mosby Co., 1942.

11. Schour, Isaac, The Effect of Hypophysectomy in the Periodontal Tissues. *J. Periodont.* 5:15 (January) 1934.

12. Schour, I.; Chandler, S. B., and Tweedy, W. R., Changes in the Teeth Following Parathyroidectomy. I. The Effects of Different Periods of Survival, Fasting, and Repeated Pregnancies and Lactations on the Incisor of the Rat. *Am. J. Path.* 13:945 (November) 1937.

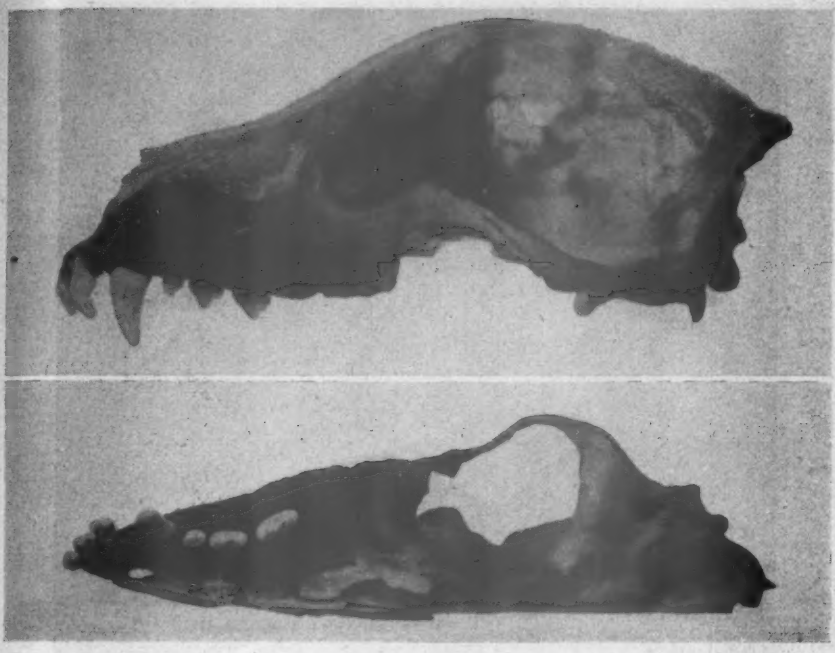

Fig. 1.—Lateral and palatal aspects of half of the skull of a dog. The entire structure is atrophic, but bone architecture is otherwise normal except about the remaining teeth. The teeth, with the exception of the central incisor, are imbedded in a loosely woven, brown-staining bone. There is a fairly sharp margin between this abnormal bone and the remainder of the skull, which may be observed especially well toward the midline of the palate

particular vitamins in maintaining the integrity of the oral tissues. Vitamin A is concerned with the cornification of epithelial tissues. Periodontal disease, evidenced by pockets and by excessive keratinization of the epithelial lining of the gingival crevice, may develop at an early age in animals on diets deficient in vitamin A. The alveolar bone then shows evidence of failure to withstand functional stress.[13]

Changes in the oral mucosa have been recognized as diagnostic signs of deficiency of vitamins of the B group. Such changes occur in patients with pellagra, beriberi and riboflavin deficiency. Recently, Mann and his co-workers[14] have reported a high incidence of periodontal disease in pellagrins.

Vitamin C is essential for the formation and maintenance of collagenous tissues, including the fibers of the periodontal membrane and the matrix of the cementum and bone in which they are anchored. Therefore, it is necessary for the repair of wounds. In animals, a long continued inadequate supply of vitamin C causes a failure of the tooth-supporting tissues to compensate for functional stress, which is also the cardinal sign of

13. Boyle, P. E., and Bessey, O. A., The Effect of Acute Vitamin A Deficiency on the Molar Teeth and Paradontal Tissues, With a Comment on Deformed Incisor Teeth in This Deficiency. *J. D. Res.* 20:236, 1941.

14. Mann, A. W., and others, A Comparison of Dental Caries Activity in Malnourished and Well-Nourished Patients. *J.A.D.A.* 34:244 (February 15) 1947.

Fig. 2.—Roentgenogram of palatal aspect of the maxilla. Toward the midline, normal bone architecture is evident. About the teeth is found abnormal bone, giving a cotton wool appearance. The lamina dura about the teeth is lacking. On one side (from which the microscopic sections were prepared) secondary infection has destroyed the bone about the premolars

the diffuse atrophy type of periodontal disease.[15]

Vitamin D deficiency is associated with failure of bone and tooth matrices to calcify normally. Such poorly calcified alveolar bone may be bent under the force of mastication.[16]

15. Boyle, P. E.; Bessey, Otto, and Wolbach, S. B., Experimental Production of Diffuse Alveolar Bone Atrophy Type of Periodontal Disease by Diets Deficient in Ascorbic Acid (Vitamin C). *J.A.D.A.* 24: 1768 (November) 1937.

16. Boyle, P. E., Effect of Various Dietary Deficiencies on the Periodontal Tissues of the Guinea-Pig and of Man. *J.A.D.A.* 28:1788 (November) 1941.

Fig. 3.—Roentgenogram of lateral aspect of the separated halves of the mandible. The lamina dura about the teeth is absent. There are numerous radiolucent areas and a pathologic fracture near the first molar on the right side. The replacement of bone with normal markings by abnormal bone structure is shown particularly well near the angle of the jaws. The coronoid processes are largely replaced by abnormally radiolucent structures. Note the bilaterally symmetric distribution of the lesions

Summary of Systemic Factors

Excessive functional demands may result in atrophy and degeneration rather than in compensatory hyperplasia. Inadequate diet; poor absorption of food, vitamins and minerals from the digestive tract; excessive metabolism, as in hyper-

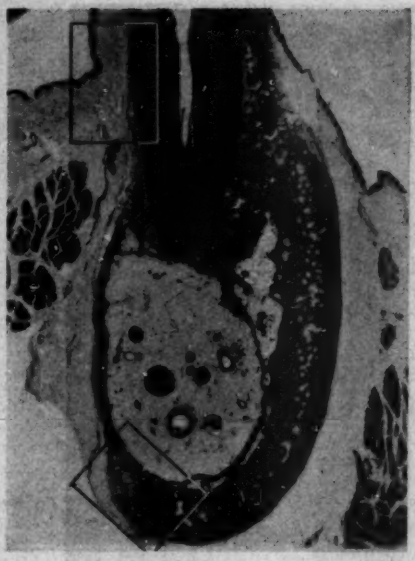

Fig. 4.—Labiolingual section through the mandible in the incisor region. The labial alveolar bone (upper left) has largely disappeared. For details see Figure 5, left. Toward the inferior border (lower left) a sharp differentiation between abnormal and normal bone trabeculae is found. For details see Figure 5, right

thyroidism; and disturbed metabolism, as in diabetes, may handicap tissues, including the periodontal tissues, in maintaining normal function. Under such conditions periodontal disease may develop and run a rapid course although local causative factors may be minimal.

The available evidence appears to indicate that the alveolar bone reacts to systemic influences in the same way as do other parts of the skeletal system. Within limits the supporting tissues of the teeth react to functional demands in much the same way as the hands become calloused where a dental instrument is held, or muscle, bone and tendon hypertrophy with exercise.

Alveolar Atrophy in a Dog

The remainder of this report is devoted to a discussion of a case which constitutes an exception to the general rule that alveolar bone reacts to systemic influences in the same way as does the remainder of the skeletal system. The subject, a dog, was chosen for study because it had an enlarged upper jaw, which caused difficulty in closing the mouth. The upper molars had been exfoliated, and the teeth remaining in the upper jaw could be moved as though they were embedded in sponge rubber.

At autopsy, evidence was found of extensive pyelonephritis. The bones were osteoporotic, and the parathyroid glands showed compensatory hyperplasia. The alveolar bone of the maxilla was replaced with greatly thickened bone of extremely poor quality. The molars had been exfoliated (Fig. 1).

The roentgenograms (Figs. 2 and 3) showed marked symmetric widening of the alveolar bone of the upper jaw. The lamina dura was lacking. Normal bone architecture had disappeared and had been replaced by tissue of a peculiar cotton wool appearance. The central part of the hard palate was normal. In the mandible, also, the lamina dura was absent. The destructive process was prominent here, with several cyst-like regions. The right side of the mandible showed a pathologic fracture.

On microscopic examination, an extensive replacement of normal bone by fibrous tissue with deeply stained irregular bone trabeculae was found. The alveolar process in both jaws seemed to be the site of the original disturbance. The periodontal membrane still could be identified about the teeth of the upper jaw, but the alveolar bone had disappeared almost entirely, and its place was occupied by a delicate fibrous tissue. The gingival attachment tissues were still at or near the enamel-cementum junction. Apparently other teeth had remained in this condition of soft tissue attachment for a period, and then secondary infection had destroyed the attachment, causing exfoliation of the teeth.

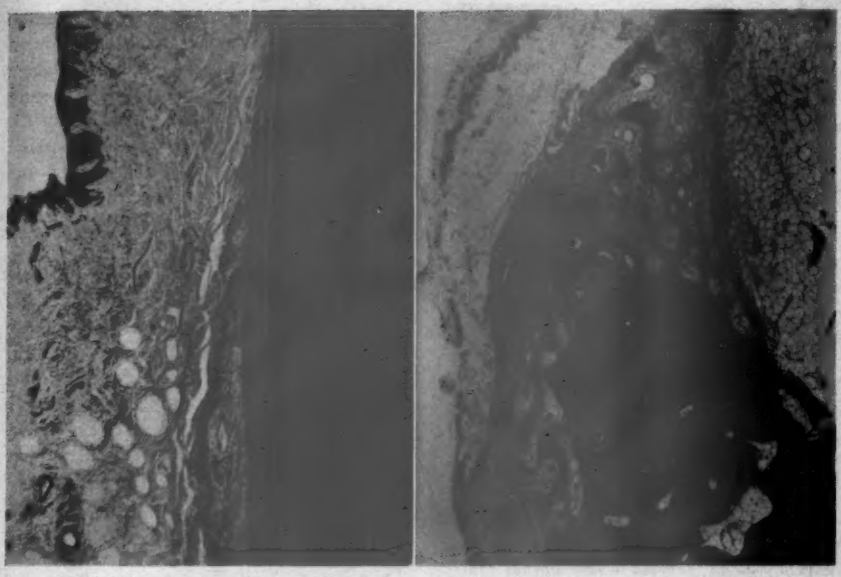

Fig. 5.—Detail of Figure 4. Left: Crest of labial alveolar process which has receded to the level of the fornix vestibuli. A few spicules of the outer cortical bone remain. The periodontal membrane has disappeared. The tooth was loose, but the gingival crevice was normal on histologic examination. There is no sign of inflammation. Right: Inferior border of the mandible. At the lower right, normal bone with haversian systems and fatty marrow spaces is evident. There is a sharp line of separation, and above, irregular bone trabeculae with fibrous marrow spaces are found

In the mandible, a similar but less advanced condition was found about the incisor teeth. The alveolar process was reduced to a few spicules of bones on the labial side (Figs. 4 and 5, left). Toward the base of the mandible was seen a line where trabecular bone and fibrous tissue replaced the normal bone with its characteristic haversian systems (Figs. 4 and 5, right).

In the maxilla, similar lines where irregular bone trabeculae replaced normal bone were found at the base of the zygomatic arch, extending toward the nasal bones and the center of the hard palate. In all instances there was a fairly sharp border between the normal bone with haversian systems and fatty marrow and the abnormal bone trabeculae with fibrous marrow. This bone was hyperplastic in the maxilla, and the alveolar margins were rounded and much enlarged. The bone was coarse and spongy and lacked strength, which accounted for the loosening of the teeth. About some teeth an inflammatory process was observed, with evidence of infection. The gingival crevice about several of the teeth was histologically free of infection, and the attachment was at or near the enamel-cementum junction. The alveolar bone, however, had been replaced almost entirely by fibrous bone trabeculae or by fibrous tissue without bone.

The bone trabeculae stained deeply with hematoxylin and in most regions merged into the surrounding fibrous tissue. In some places, however, seams of osteoid tissue were observed. Here, normal appearing osteoblasts bordered the osteoid tissue. The blood vessels were numerous and thin walled. The fibrous

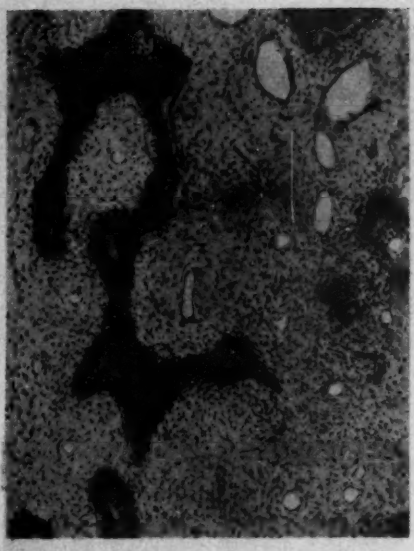

Fig. 6.—Bone trabeculae and fibrous marrow from the maxilla. The bone is deeply stained and fibrous, but in some regions an osteoid seam with normal osteoblasts is observed. This appears to be a later stage then that found in diseased parts of the mandible. The marrow spaces are fibrous. About several of the blood vessels the fibrous tissue appears to retain the architecture of former haversian systems

tissue cells about many of them were arranged in a fashion suggestive of former haversian systems (Fig. 6). In some regions, osteoclasts were numerous; in others, hemorrhage had occurred.

Similar findings in human beings have been described by Trauner.[17] In some of his cases, the bones of the skull as well as of the face were involved. He believed the process to be a hyperostosis of autonomous nature.

The relation of the disease described by Trauner[17] to the fibrous dysplasia of bone described by Lichtenstein and Jaffe[18] is not clear. The roentgenologic and histologic appearances are closely similar, if not identical. Fibrous dysplasia, however, occurs in many bones, including those of the face and skull; the lesions in Trauner's cases were confined to the latter sites. In severe cases of dysplasia there was involvement of many bones and also extraskeletal changes, including pigmentation of the skin and manifestations of abnormal endocrine activity. Trauner's disease and fibrous dysplasia of bone have in common the fact that the lesions show no tendency to become malignant.

This report of a lesion found in the mandible and maxilla of a dog has been presented and discussed in some detail for two reasons. First, periodontists have often maintained that the alveolar bone differed from bone elsewhere in its reactions to disease. This isolated and certainly unusual case is an extreme example of such a difference in reaction. Second, periodontists often concentrate on local factors to such an extent that they are unwilling to recognize the role of predisposing or constitutional factors. Here is an instance in which loss of alveolar bone was practically total about several teeth and yet the gingival tissue had remained intact without pocket formation. Loss of other teeth by exfoliation was obviously a late phenomenon, occurring subsequent to bone destruction.

Summary

Heredity and endocrine and vitamin deficiency diseases affect the periodontal tissues. The literature indicates that alveolar bone reacts to systemic influences as does bone in other parts of the skeleton. Evidence that there are exceptions to this general rule was obtained from roentgenologic and histologic study of a dog in which the alveolar bone was partially replaced by abnormal bone trabeculae and fibrous tissue whereas other parts of the skeletal system were unaffected.

17. Trauner, Richard. Über Hyperostosen der Kiefer- und Schädelknochen. *Virchows Arch. f. path. Anat.* 303:603 (June 6) 1939.
18. Lichtenstein, Louis, and Jaffe, H. L., Fibrous Dysplasia of Bone. *Arch. Path.* 33:777 (June) 1942.

PERIODONTAL DISEASE IN CHILDREN

Sylvia E. Zappler, D.D.S., White Plains, N. Y., and New York

THE study of periodontal disease in children has been, until recently, a sadly neglected aspect of dental research and practice. Based on the observations and findings of twenty years of practice in pedodontics, I have arrived at the opinion held by McCall,[1-3] that more attention should be given to periodontal disease in children. It may well be that the early detection, prevention and treatment of periodontal disturbances in children could, in many instances at least, lead to the near eradication of this condition in later life and the production of a generation of adults comparatively free from the accumulated defects caused by early neglect.

For the last two years, in particular, my attention has been centered on the study of periodontal disease in children. The interest and cooperation of L. E. Holt, Jr. made possible the examination of the children in the wards of the Children's Medical Service, Bellevue Hospital, Department of Pediatrics, New York University. Similarly, J. G. F. Hiss provided the opportunity for the study of the young patients in the Wieting Johnson Memorial Hospital at Syracuse, N.Y., an institution for the treatment of children with rheumatic fever and rheumatic heart disease. The examination of healthy children of all age groups was made possible through the courtesy of H. K. Addelston, Department of Dentistry for Children, and of S. C. Miller and J. L. Blass, Department of Periodontia, New York University College of Dentistry.

Additional observations were made while I was on assignment as senior dentist in charge of a dental trailer under the auspices of the New York State Department of Health, to do corrective dental treatment of preschool children.

The purpose of this paper is to present a résumé of these observations and findings which, it is hoped, may serve as a basis for further study and discussion.

Anatomy and Clinical Appearance

Although the basic differences in the anatomy and clinical appearance of the periodontal structures of children, as compared with those of adults, are most significant, the dental literature does not contain a comprehensive discussion of this subject. The special features to be discussed here do not attempt to give a complete review of all the differences between the periodontium of the child and that of the adult. Further studies in this direction still must be made. However, a brief review of the apparent differences in the structure of the periodontal tissues in the child and in the adult will help us to understand some of the differences in the clinical manifestations of periodontal disease in children and adults.

The Gingivae.—The gingivae in the de-

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1. McCall, J. O., Gingival and Periodontal Disease in Children. *J. Periodont.* 9:7 (January) 1938.
2. McCall, J. O., Treatment of Periodontal Disease: Preventive Phase. *J.A.D.A.* 28:1303 (August) 1941.
3. McCall, J. O., Dental and Periodontal Diseases in Children, in Miller, S. C., *Oral Diagnosis and Treatment Planning*. Philadelphia: The Blakiston Company, 1943, p. 75.

ciduous and changing dentitions are as likely to be reddish as pink. This probably is due to the thinner epithelial layer, a less dense hornified layer and the greater vascularity. Of the children examined in the trailer, ranging in age from 4 to 7 years, 56 per cent had pink gingivae, and the remaining 44 per cent had reddish gingivae.

Nor do the gingivae of the child have the typical stippled appearance seen in the adult. They are visibly smoother. This may be due to the shorter and flatter papillae of the lamina propria. The gingivae in the young person are not as dull as in the adult but are shinier. The greater abundance of salivary and mucous glands and their greater activity in childhood may account for this phenomenon.

In children, the tone of the gingivae is frequently flabbier, the connective tissue of the lamina propria being less dense.

The marginal gingivae of erupting teeth do not have the knife-like edge typical of these tissues in the healthy adult but are thicker, rounded and rolled up. In all probability this is due to the hyperemia and edema that accompanies the eruption of teeth.

The depth of the gingival sulcus in erupting teeth and in young permanent dentitions, according to several authors[4-6] and verified by my studies, is usually greater. The depth of the sulcus in newly erupted teeth is, in general, 2 to 3 mm. Sometimes, however, it is possible to penetrate on the buccal aspect in erupting upper incisors to a depth of 5 to 6 mm., without causing pain or bleeding or finding any resistance. However, according to Gottlieb,[7] the epithelial attachment in youngsters is attached to the enamel of the tooth "in the form of a wide band which becomes gradually narrower as the separation of the epithelium from the enamel surface proceeds." The deeper sulcus in children probably is due to the lag of passive eruption behind the active. The accompanying hyperemia and edema prevent the physiologic atrophy of the gingival margins.

Cementum.—There is only a thin layer of cementum in newly erupted teeth in children. Its calcification is less dense. According to Gottlieb,[8] there is a tendency in young persons toward hyperplasia of the highly vital cementoid layer apical to the epithelial attachment.

Periodontal Membrane.—The thickness of the periodontal membrane is greater in young persons. During the process of eruption and until the tooth is subjected to the functional stress of mastication, the fiber bundles of the periodontal membrane are less dense; there are more loose and irregularly arranged fibers and fewer collagenous fibers. The spaces between the connective tissue fibers are greater and, as Hulin[9] stated, the tissue is more hydrated. Because of the thin layer of cementum present, only a short section of the periodontal fiber is incorporated in it.

The blood and lymph supply is more abundant in the periodontal membrane of the young person.

The mobility of the teeth during eruption is not pathologic, but is due to the existent state of structure of the periodontal membrane and to the incomplete formation (shortness) of the roots.

Alveolar Bone.—In the developing alveolus, the lamina dura is thinner. The trabeculae in the supporting bone are fewer, and the calcification is less dense. The marrow spaces are greater. The blood and lymph supply is more abundant. The alveolar crests in the deciduous denti-

4. Müller, A. M., *Ueber die Tiefe der Zahnfleischtaschen bei Jugendlichen.* Breslau: Volkswacht Buchdruckerei, 1929.
5. Löhren, H., *Vertiefte Zahnfleischtaschen und Parodontitis bei Jugendlichen.* Bonn: H. Trapp, 1933.
6. Willman, W. P., *Periodontia.* New York: National Medical Book Company, 1938, p. 75.
7. Gottlieb, Bernhard, Gingival Sulcus and Epithelial Attachment, in Orban, Balint, *Oral Histology and Embryology.* St. Louis: C. V. Mosby Company, 1944, p. 212.
8. Gottlieb, Bernhard, personal communication to the author.
9. Hulin, C., *Les Parodontoses Pyorrhéiques.* Paris: R. Foulon, 1941, p. 79.

tions are flatter; in the newly erupted permanent teeth they are more pointed than in the adult. Owing to its greater content of organic matter, the bone is more plastic.

General Physiology and Pathology

Since the periodontal tissues are related intimately to the rest of the body, it may be well to mention here briefly some features peculiar to the general physiologic characteristics of the growing child in health and in disease and to correlate them to the physiologic characteristics of the periodontal tissues in health and in disease in this age group.

The growing organism is in a continuous state of flux and instability. Various organs develop at different periods and at varying rates, the biochemical composition of the body tissues and tissue fluids undergoing a continuous change. Each age period presents, therefore, its physiologic and pathologic peculiarities of the tissues and its specific problems. In different periods of life the organism is more susceptible to some types of diseases and not as susceptible to others. The distinctive biochemical composition of the cells and tissue fluids in each age period might account for the difference in response to various pathogenic agencies. The growing organism seems to be more prone to noxious influences. Its response to such influences is more acute and intense than in the adult. Minor disturbances may affect it entirely out of proportion to their severity. But, as Holt[10] said, "If acute disease is survived the great changes in the tissues which result from growth and the greater capacity for repair in early life make the ultimate prognosis often far better than would be the case with adults. The extent to which the consequences of disease may be 'outgrown' is often remarkable, provided the nutrition of the body can be maintained at its best."

In the first years of life, acute infectious diseases and disorders of the gastrointestinal tract, often accompanied or followed by nutritional deficiencies, play a great role. They temporarily may arrest growth and development. The chronic forms of diseases are relatively less frequent in childhood than in the adult, and in general, retrogressive and degenerative changes are rare.

What has just been said about the general physiologic and pathologic characteristics of the individual during childhood holds equally true in regard to the growing and developing tissues of the periodontium of the child. Acute periodontal disturbances are extremely common in childhood. Chronic periodontal disturbances are less frequent. Atrophic and degenerative changes are rare.

Pathologic Conditions

Orban[11] distinguishes the following groups: inflammation (gingivitis and periodontitis), traumatism (periodontal traumatism), hypertrophy (gingival hypertrophy), atrophy (periodontal atrophy) and degeneration (periodontosis). His classification and nomenclature of periodontal disturbances are adhered to in the following description.[12]

Gingivitis.—Because of the thin epithelial layer and the slight hornification, the gingivae are prone to suffer during childhood from the deleterious effects of noxious agencies. Hence the frequency of gingivitis is great. But the reaction of the gingival tissue to injurious agencies in this age period is characterized by a quicker and more marked response on the one hand and a greater recuperative power on the other. Thus, although the gingival inflammation may be more intense in children, it usually is limited to the more superficial layers and seldom

10. Holt, L. E., Jr., and McIntosh, R., *The Diseases of Infancy and Childhood*. New York: D. Appleton-Century, 1940, pp. 55-56.

11. Orban, Balint, Classification and Nomenclature of Periodontal Diseases. *J. Periodont.* 13:88 (July) 1941.

12. Orban's most recent classification had not been published at the time this article was written.

involves the deeper structures, provided the resistance is not lowered by some chronic systemic involvement. In this connection, 2 patients whom I observed while working in the trailer appear significant. The medical records of both children, aged 5, showed that an oral condition had been diagnosed by the examining physician as a severe Vincent's infection. This condition apparently had been cured one month previously. There was no evidence of the pre-existing infection. The gingivae and interdental papillae appeared to be perfectly healthy.

Local Gingivitis.—In cases of local gingivitis there are, besides the etiologic factors responsible for this disturbance in adults, other local factors which are peculiar to the child:

1. Accelerated eruption of teeth. The passive eruption lags behind the active and results in the formation of pockets. These pockets, together with the thicker marginal gingivae characteristic of the eruption period, invite the accumulation of soft deposits and infection.

2. Loose deciduous teeth which irritate the periodontium during mastication.

3. Partly resorbed roots of deciduous teeth which cause sharp enamel points to injure the gingivae during mastication.

4. Teeth erupting in malposition and producing crowding of the arch, with areas of food impaction resulting from the consequent irregularities (Fig. 1).[13]

5. Excessive overbite (a) where the lower anterior teeth strike the palatal gingival tissues of the upper anteriors; and (b) where the upper anterior teeth force food, during mastication, onto the gingival tissues of the lower anterior teeth.

6. Orthodontic appliances in children with inadequate oral hygiene.

7. Improperly fitted orthodontic bands or springs.

8. Adenoids, with consequent mouth breathing.

9. Caries, a prominent etiologic factor in local gingivitis in children because of the generally neglected care of the deciduous dentition. In children proximal decay is more prevalent than occlusal caries, as the shallow pits and fissures do not lend themselves to the accumulation of food debris. Extensive proximal caries resulting in the breakdown of the marginal ridges not only creates areas of food impaction with consequent local gingivitis but leads also to unilateral mastication because of the pain in the affected tooth. A widespread gingivitis frequently develops on that side of the oral cavity which becomes afunctional in this manner. Deep caries with pulp involvement may act in still another way as an etiologic factor in gingivitis. Children are especially sensitive to oral discomfort and will avoid resistive foods in the presence of pain. Thus, the cleansing and stimulating effect of detergent foods is denied to the gingivae, and the accumulation of soft food debris at the gingival margins is increased. This condition, as is well known, favors the development of gingivitis.

10. Calculus is considered to be one of the chief etiologic factors in gingivitis in adults, but plays a negligible role in childhood as it is rarely encountered before the age of 10 to 12 years.

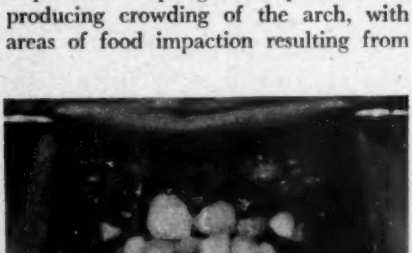

Fig. 1.—Local gingivitis in a child, aged 10. Note inflamed hypertrophic gingivae; malposition and malocclusion

13. All illustrations were obtained from New York University, College of Dentistry, by courtesy of S. C. Miller, J. L. Blass and C. B. Schatz.

Kranz[14] reported that he had observed excessive calculus formation in many children in the age group of 10 to 12 years in upper Alsace. In diabetic children and in young cretins a great amount of calcareous deposition frequently is found.

General Gingivitis.—Generalized gingivitis, in contrast to local gingivitis, is encountered less frequently in healthy children. It is more commonly seen in ill children.

The causes are about the same here as in adults, but infections, especially the exanthematous diseases and gastro-intestinal disturbances so common in childhood, play a great role as etiologic factors in this age group. All diseases characterized by high fever usually are accompanied by xerostomia owing to the diminished salivary secretion. The cleansing effect of the saliva is lacking and the prevalently soft diet contributes to the stagnation of contaminated mucinous food debris accumulated about the gingivae. This often causes a severe gingivitis with marked hyperemia and edema and the type of pocket formation previously mentioned. Stransky,[15] of the Department of Pediatrics of the University of Manila, confirmed my repeated observations that most of the children with infectious diseases or other disturbances accompanied by prolonged high fever suffer from a generalized gingivitis which often is aggravated by nutritional deficiencies. During my work in a hospital for tuberculous children in Vienna and in the wards for tuberculous children at Bellevue Hospital, it was found that children with active tuberculosis who are bedridden for many weeks or months are especially prone to generalized gingivitis with a tendency toward bleeding. Generalized gingivitis also was observed in diabetic children and in children with the celiac syndrome, disturbed lipoid metabolism, blood dyscrasias, congenital heart disease, kidney disorders and various endocrine disturbances. Talbot[16] reported cases of generalized gingivitis in most of the patients in institutions for mentally defective children. This confirms my observations in the children affected with cretinism in Bellevue Hospital and in an institution for mentally defective children in Vienna. These children all had red swollen gingivae. Soft and calcareous deposits were present around the necks of the teeth (*Schmutzpyorrhoe*).

The patients in the Wieting Johnson Memorial Hospital showed, despite excellent oral hygiene, strikingly pale gingivae with a violaceous hue in certain cases. There were no signs of inflammation of the gingival structures in these children, but the severe anemia of the gingivae may lead to a periodontal disturbance in later life.

Nutritional deficiencies, even in subclinical forms, long have been pointed to as a possible etiologic factor in generalized gingivitis in children. The recent report of Addelston and Chilton[17] proved that such deficiencies are indeed as frequent a cause of this condition in children as in adults. Stransky[15] reported severe gingivitis and loosening of the teeth in children with beri-beri in Manila hospitals. During the food shortage caused by the war, the population was forced to shift from its normal diet of rice to other foods. This led to a decrease in the incidence of beri-beri and of the accompanying gingivitis.

Allergic conditions (foods, drugs and so forth), to which children are especially prone, also are frequently the cause of generalized gingivitis. In the trailer, several preschool children who had a marked reddening and swelling of the gingivae, were observed. Their mothers revealed on questioning that these chil-

14. Kranz, P., and Falk, K., *Alveolar Pyorrhoe*. Leipzig: H. Meusser, 1922, p. 11.

15. Stransky, E., Personal communication to the author.

16. Talbot, E. S., *Interstitial Gingivitis*. Philadelphia: The S. S. White Dental Manufacturing Company, 1899.

17. Addelston, H. K., and Chilton, N. W., The Role of the Dentist in Nutritional Supervision and Correction for the Child Patient. In press.

dren had hay fever and that during an acute attack blisters often appeared on the gingivae as well as on the tongue.

In children not affected with chronic systemic diseases, the healing of the gingival disturbances, as previously stated, is usually complete, owing to the great recuperative power which enables the child to overcome the disturbance before it reaches the deeper tissues.

Periodontitis.—Acute apical periodontitis after death of the pulp because of deep caries frequently is observed in the young dentition. If the tooth is not extracted, chronic periodontitis with the rapid formation of a fistula develops. But this phase of periodontal disease does not belong within the scope of this paper.

Marginal periodontitis (simplex) after gingivitis, with development of deep pockets, is rarely seen in healthy children (Fig. 2). Gottlieb[8] is of the opinion that the hyperplasia of the highly vital cementoid layer apical to the epithelial attachment acts as a barrier to the downgrowth of the epithelium and thus prevents pocket formation.

However, in children with systemic disease the resistance is lowered, and the recuperative mechanism seems to be handicapped. Thus, the inflammation of the gingivae may spread more easily to the deeper tissues. Once the inflammation reaches the alveolar bone, its destruction, on account of its comparatively lesser density in the young dentition, progresses more rapidly and is more severe than in the adult. In these cases pus frequently may be observed.

The incidence of periodontitis complex, a secondary inflammatory reaction of deep pockets in periodontosis, is low in childhood since periodontosis (discussed in a later section) is encountered rarely in this age period.

Traumatism.—Periodontal traumatism also is encountered in children. It is rarely observed in the deciduous dentition. I have not come across a single case in which the child complained of pain caused by too high a restoration in a deciduous tooth. The ability of the periodontal tissues to adjust themselves to undue stresses thus appears to be greater in the deciduous than in the permanent dentition. However, in the young permanent dentition, occlusal trauma is a remarkable factor in causing periodontal disturbances (Fig. 3). McCall[18] reported several instances of pocket formation on the mesial aspect of lower first molars in mouths in which the neighboring deciduous second molar had been extracted and the first molar had drifted and tilted.

In my own experience, traumatic occlusion in crowded lower teeth was en-

18. McCall, J. O., Personal communication to the author.

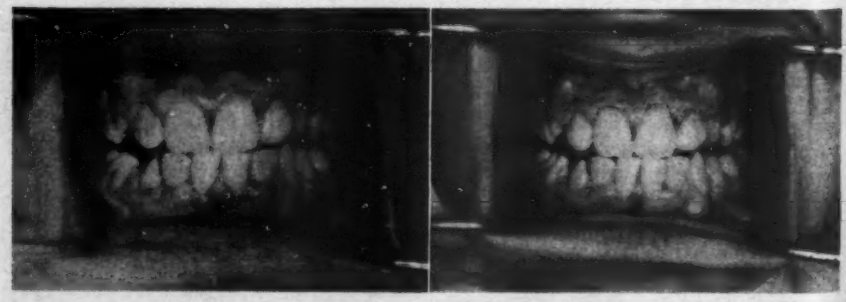

Fig. 2.—Left: Marginal periodontitis in a boy, aged 11. Note inflammation and hypertrophy in lower anterior region. Roentgenograms showed marginal atrophy of alveolar bone. Probable causative factors: occlusal trauma, improper mouth hygiene, dietary deficiency. Right: After treatment. Note recession of gingival margins around lower central incisors.

countered frequently. Atrophy of the gingivae and sometimes of the alveolus, as confirmed by roentgenologic examination, were characteristic features in those cases.

In a case in the ward for tuberculous children at Bellevue Hospital, the child, a girl of 8 with active tuberculosis, had a marked reddening and swelling of the entire marginal gingivae. There was a deep overbite and a crowding of the upper and lower anterior teeth. Both lateral incisors of the upper and lower dentition were in lingual position. Both lower central incisors showed a second degree mobility, calculus formation, deep pockets, and gingival and alveolar atrophy. The upper central incisors showed a first degree mobility with no calculus formation but with slight recession of the gingivae and beginning alveolar resorption. There was a great amount of caries which had caused complete destruction of the crowns of the deciduous and also of the permanent molars. The occlusal trauma activated by the lowered resistance was probably the main factor responsible for the periodontal disturbance.

Other cases of occlusal traumatism were those in which active eruption of lower bicuspid teeth was accelerated to such an extent (in some cases because of premature extraction of deciduous molars) that root formation was not adequate and the immature periodontal membrane could not bear the masticatory stress. When I discussed these cases with McCall, he remembered a child who complained of pain on mastication in a newly erupted lower bicuspid. Roentgenograms showed that the root was incompletely developed. The tooth had to be ground out of occlusion temporarily in order to give the root and the periodontal membrane fibers time to develop.

Still other periodontal involvements caused by traumatic occlusion in childhood are encountered in those cases in which, during improper orthodontic treatment, movement of the teeth is not supervised carefully and a cusp-to-cusp relationship (jiggling) of a tooth occurs. Soreness, loosening and eventual loss of

Fig. 3.—Traumatism in a boy, aged 9. Note inflammation around lower central incisors

these teeth are characteristic features of this type of periodontal disturbance.

Hypertrophic Gingivitis. — Hypertrophic gingivitis (Figs. 1 and 2) caused by the accumulation of inflammatory or leukemic cells, increase of fibrous tissue or hyperplasia of the epithelium, is encountered frequently in children. As this condition is adequately dealt with in all textbooks of periodontia, I will not enlarge further on this form of periodontal disease. However, two facts should be stressed: First, besides the etiologic factors encountered in adults, adenoids with consequent mouth breathing are here once again an important etiologic factor peculiar to childhood. Second, the incidence of hypertrophic gingivitis increases considerably with the onset of secretion of the gonadal hormones.

Periodontosis and Alveolar Atrophy. — In contrast to the high incidence of hypertrophic periodontal disturbances in children, degenerative and atrophic (retrogressive) changes such as periodontosis and severe alveolar atrophy are rarely found in healthy children. The forces of nature during growth and development are appreciably more progressive and constructive than retrogressive and destructive.

Weinmann and Orban[19] have said that they never have observed any cases of

19. Weinmann, J. P., and Orban, Balint, Personal communication to the author.

periodontosis and alveolar atrophy in the deciduous dentition.

The only case I have encountered was during my work in the dental trailer.

A girl, 3 years of age, had gingival atrophy on the labial aspect of the upper anterior teeth. There was no sign of inflammation, no loosening of the teeth and no traumatogenic occlusion. The child was pale, frail and seemed to be rather small for her age. She was also particularly nervous and anxious. The medical history and physical examination by a physician revealed no systemic or local factor which could have been the cause of this disturbance.

In older children with chronic systemic disease, such as untreated or uncontrolled diabetes, other metabolic disturbances (faulty lipoid metabolism), blood dyscrasias and so forth, periodontosis and alveolar atrophy may be encountered more often.

The following case is that of a 10 year old girl who was seen at Bellevue Hospital.

She was lively and active and looked healthy, but her growth was stunted. All the deciduous and permanent teeth present had a third degree mobility and had been ligated by the attending dentist for better mastication. The gingivae were extremely red and swollen, and roentgenograms revealed a nearly complete absorption of alveolar bone around the teeth. There was no pain or pus. The mother explained that the child had lost one tooth after another without pain. The history revealed a disturbance in fat metabolism dating back to the eighth month of life when the first attack of steatorrhea had occurred. The steatorrhea still recurred from time to time. No definite clinical diagnosis had been made despite several thorough clinical examinations with laboratory tests. The tentative diagnosis had been pancreatic deficiency.

Fig. 4.—Gingivitis at puberty in a boy, aged 14. Generalized fibrous hyperplasia of gingivae. Rampant decay, filthy mouth. No systemic background could be established by routine medical examination

The incidence of periodontosis and alveolar atrophy increases considerably at the time of puberty.

Period of Puberty

Before proceeding further in the discussion of periodontal disease at the time of puberty, a period which still belongs to childhood, it is deemed advisable, in order to make the presentation comprehensible, to give brief consideration to some physiologic and pathologic peculiarities of the organism in general at this period and to correlate them with characteristic periodontal disturbances.

The tremendous physical, psychic and emotional changes which take place at the time of puberty are well known. They affect practically every organ and tissue in the body, structurally and physiologically, and modify, to a certain degree, the physicochemical and biochemical composition of all cells and tissue fluids. Growth and development are stimulated to the maximum. It is the last spurt of growth. After the endocrines, which at this period are said to fall into a state of disbalance through the suddenly increased influence of the gonads, have adjusted themselves to the new situation, the body functions regain their equilibrium during adolescence. But those tissues or organs which have been weakened through some constitutional or local factor are unable to keep pace with the sudden and tremendous changes. They may become chronically ill or exhausted and may begin to "die." Once the impulse of growth diminishes, the response of the tissues becomes slower and the recuperative and regenerative powers begin to decline. Disturbances which heretofore could not be recognized in

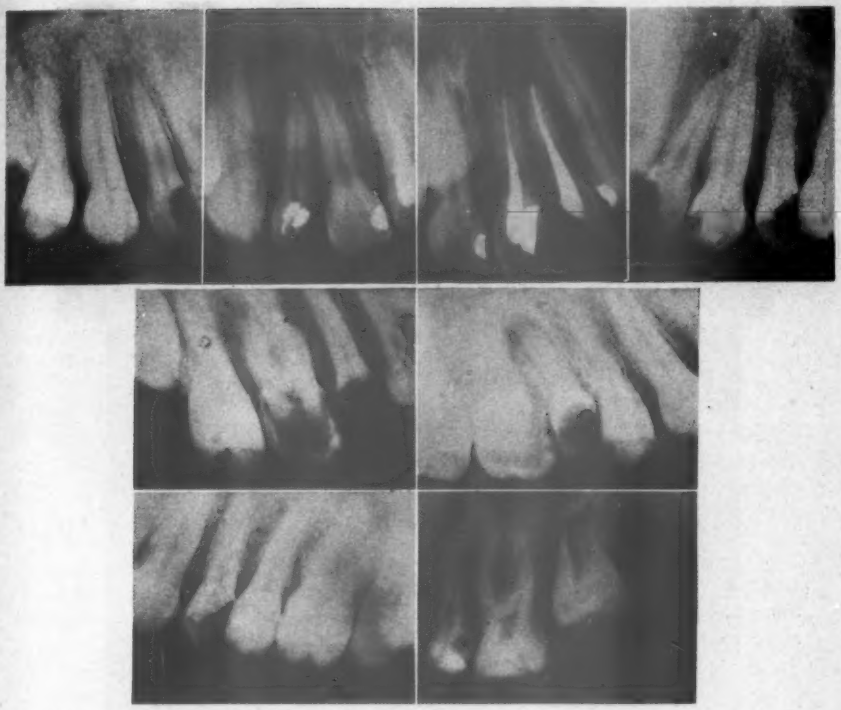

Fig. 5.—Roentgenograms of mouth shown in Figure 4 (see also Figure 6). Note fairly good condition of bone in spite of alarming gingival condition.

their latent or subclinical state may now become apparent and chronic disorders. Retrogressive and degenerative processes increase in incidence. After puberty the pathologic characteristics of the organism in the young person begin to approach more closely those of the adult.

As regards the periodontal structures, here also the more chronic forms of periodontal disease increase in incidence, and retrogressive and degenerative changes begin to occur more frequently.

Periodontal Structures

Gingivitis.—At the time of puberty a generalized gingivitis, characteristic for this period, frequently is seen in both boys and girls (Figs. 4-7). The name of *Pubertaetskatarrh* was given to it in Germany.[20] The clinical picture is that of a *Schmutzpyorrhoe*. There is marked reddening and swelling of the gingivae and a tendency to bleeding. There is often hypertrophic growth especially of the papillae of anterior teeth when they are in malposition. Calculus formation becomes more extensive, and there are both soft and hard deposits on the teeth and beneath the gingival margins.

A group of high school children, boys and girls, examined in the dental trailer showed general gingivitis in 31 per cent and local gingivitis in 41 per cent of cases. Hypertrophy was found in 35 per cent of the children, soft deposits in 61 per cent and calculus in 35 per cent. In 14 per cent of the children, recession

20. Weski, O., cited by Löhren, H.[5]

Fig. 6.—Roentgenograms of mouth shown in Figure 4 (see also Figure 5)

of the gingivae had taken place, mostly in anterior lower teeth which were in malposition. There was also alveolar resorption as demonstrated by roentgenologic examination. It is interesting to note in this connection that 86 per cent of these children had malposed teeth.

Several etiologic factors might account for the great incidence of generalized gingivitis in children at the time of puberty: (1) neglect of oral sanitation owing to the fact that hygiene is less carefully supervised by their parents or guardians who tend to regard them as beyond the need for such supervision, (2) influence of the gonadal hormones, (3) malpositions of teeth, with or without malformation of the jaws, resulting in imbalance of occlusal stresses, (4) psychic and emotional stresses and strains to which children are prone in this age period, as well as imbalance in calcium-phosphorus metabolism, leading often to hypertonicity of the muscles of mastication, (5) changes in the capillary system attributable to the sudden rise in blood pressure caused by the great increase of the body surface area during this period, (6) physical and chemical changes in the composition of the saliva, and (7) nutritional deficiencies which, even if present in only a subclinical state, might nevertheless contribute to the disturbance in the periodontal tissues.

One of the apparent reasons for the frequent occurrence of nutritional deficiencies, based on observations made during the tour in the dental trailer, is the fact that boys in this age group prefer to spend the money given to them for their school luncheon, on motion pictures. The girls seem to consider lipsticks and nail polish and the motion pictures more important than an adequate diet. In addition, they begin to be particularly concerned about their figures and, in order to avoid becoming too stout, reduce the amount of food intake just at a time when the body has the greatest need for building material.

There are, undoubtedly, still other as yet unknown factors which might play a role in the etiology and great incidence of generalized gingivitis at this period.

Periodontitis. —If the gingivitis is neglected, Vincent's infection may become superimposed, or the inflammation may spread to deeper tissues and lead to a marginal periodontitis with resorption of the alveolar margins. Systemic involvement may aggravate this condition, and the destruction may progress to such an extent that marked loosening or even loss of the teeth may result later.

Periodontal Atrophy. —Cases of periodontal atrophy following inflammation are more commonly seen after puberty than prior to that time.

Periodontal atrophy caused by toothbrushing is not encountered in this age group because brushing, if practiced at all, is not done in such a vigorous way as to produce these lesions.

Fig. 7.—Gingivitis at puberty in a boy, aged 16. Generalized edematous swelling of gingivae. Poor mouth hygiene, high carbohydrate diet, mouth breathing

Fig. 8.—Periodontal atrophy in a girl, aged 15. Teeth in nonocclusion; vitamin D deficiency and calcium-phosphorus disbalance

Disuse and traumatic occlusion, however, become more prominent factors in the causation of periodontal atrophy in this age group. Calculus, which begins to occur with greater frequency, acts as a contributing factor. The anterior teeth in nonocclusion (Fig. 8), as in open bite, and those in traumatic occlusion (Figs. 9 and 10), especially in those cases in which one or more molars were lost and no replacement was made, show calcareous deposits on and beneath the gingival margins. Roentgenologic examination proves that most of these teeth are affected by alveolar atrophy. In many cases a first degree mobility is found.

Presenile Atrophy. —Thoma[21] (page 694) defined presenile atrophy as "senile atrophy occurring in young individuals whose other functions are still at their height," and said, "The affected individual seems in normal health and generally shows no other senile changes." There is a recession of the gingival margins, usually encountered in anterior teeth or permanent first molars, but no signs of inflammation are apparent. The etiologic factor is mostly unknown. Idiopathic alveolar atrophy, according to my findings, is not too rarely encountered at the time of puberty. Hulin[22] stated

21. Thoma, K. H., *Oral Pathology*. St. Louis: C. V. Mosby Company, 1944.
22. Hulin, C., Personal communication to the author.

Fig. 9.—Periodontal atrophy in a girl, aged 13. Occlusal trauma; malocclusion

that in children a form of alveolar atrophy may be found uniformly distributed over the maxillae. He ascribed this pathosis to an osseous dystrophy of the rachitic type. Roy[23] expressed the opinion that "juvenile atrophy is an adolescent disease characterized by alveologingival resorption on the buccal surfaces of all the teeth with no mobility." He correlated this atrophy with the appearance of the gonadal hormones. Woods and Wallace, as quoted by Goldman,[24] reported a case of alveolar atrophy of unknown origin in a child 10 years of age whose chief complaint was that of loose teeth. With the exception of this complaint the child appeared to be well developed and in good health.

The histopathologic picture in presenile atrophy, as based on the findings of most of the authors, is said to be that of retrogressive changes in the periodontal tissues similar to that in physiologic atrophy in old age.

Periodontosis.—Periodontosis, too, makes its appearance at the time of puberty. The clinical examination of children in this age group (both boys and girls but most frequently girls) reveals a condition wherein, aside from the slight deviation from the normal position of an anterior tooth or a slight loosening of one or more permanent first molars, no other demonstrable pathologic condition appears. The patient is unaware of any abnormality, and only a careful roentgenologic examination reveals the beginning pathosis. But in persons of adolescent age the phenomenon of periodontosis is encountered more often. These patients present themselves with the complaint of migration of one or more anterior teeth or the loosening of molars. The roentgengrams reveal an already marked destruction of the alveolar socket, and it can be assumed with good reason that the beginning of the pathologic process may date back to an earlier age. The history and thorough physical examination corroborated by laboratory tests usually reveal no systemic involvement.

Deep pocket and pus formation are still not too commonly encountered at the time of puberty as they are a late phenomenon in this pathosis. Their incidence increases, however, in later adolescence.

Thoma[21] (page 716) stated that periodontosis "is generally believed to be a disease of early middle life. . . . A great number of cases falling into the age group of 14 to 25 years have been seen,

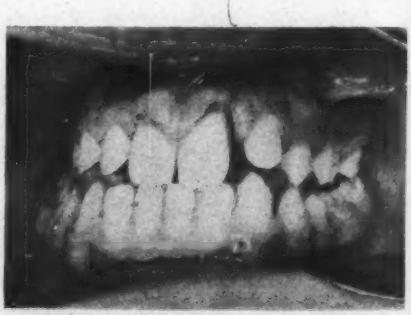

Fig. 10.—Periodontal atrophy in a boy, aged 15. Note recession of gingival margins at upper left central incisor. Roentgenograms showed marked alveolar atrophy

23. Roy, M., Les Formes Cliniques de la Pyorrhée Alvéolaire. *L'Odontologie* 71:433, 1933.

24. Woods, E. C., and Wallace, W. R. J., cited by Goldman, H. M., *Periodontia; a Study of the Histology, Physiology and Pathology of the Periodontium and the Treatment of Its Diseases.* St. Louis: C. V. Mosby Company, 1942.

however, since we have learned to recognize the disease."

Weinmann and Orban[19] reported that in the permanent dentition periodontosis with pocket formation is not too rare in the age which still belongs to childhood. These cases, according to their observation, occur nearly exclusively in girls in or just before puberty.

Nespoulous[25] said that at the Eastman Dental Dispensary in Paris cases of pyorrhea alveolaris had been observed only in patients 14 years of age or older; that is, after the development of the sex glands had taken place.

The histopathologic picture in periodontosis in the young person is no clearer than in the adult. Pending further studies in this connection, it must be assumed that the pathologic picture runs a parallel course in the various age groups.

According to Box,[26] it is a picture of pericementitis fibrosa; thus it is primarily an inflammatory lesion.

Orban and Weinmann,[27] on the other hand, expressed the opinion that it is primarily a noninflammatory process, the histopathologic picture, in its initial stage, being that of degeneration of the fibers of the periodontal membrane.

Gottlieb[28] also regarded is as a noninflammatory process but fixed responsibility for the condition on a disturbance in cementoblastic activity (cementopathia) followed by cessation of cementum formation with subsequent detachment of the periodontal fibers and alveolar bone resorption.

Thoma[21] (page 721) believed that the primary lesion is an alveolar bone resorption by lacunar or vascular resorption, or osteolysis.

The cause of atrophic, degenerative and retrogressive changes in the periodontal structures of a young person are, in most cases, as obscure as in the adult. It is thought that intrinsic factors are primarily responsible for those disturbances but that constitutional factors have to be considered, too. Further research will be necessary in order to determine the cause, prevention and treatment of periodontosis in young persons. This need is particularly pressing in view of the tragic consequences of this disturbance at a later age.

Summary and Conclusions

A review of the various phases of periodontal disease in children is presented on the basis of personal observations and findings. An attempt is made to show that the periodontal tissues, like the body in general, are more resistant or more susceptible to different types of disease at the various age levels, and that after puberty the phenomena of disease processes in the periodontal tissues begin to approach those seen in adults.

I am in agreement with MacNider[29] who believed that the alterations in the biochemical constitution of the cells of the aging individual may, in a measure, regulate the susceptibility or resistance of the cells to certain outside agencies or disease. These biochemical alterations within the aging cells in general and in the periodontal structures in particular have not as yet been sufficiently investigated. It may be, therefore, that a histochemical approach to the problem of periodontal disease in the child as it advances through the different age periods may bring us nearer to the solution of this problem and, with it, to the prevention of all periodontal disease.

To quote Holt,[10] "There is no more promising field in medicine than the prevention of disease in childhood."—33 *Davis Avenue, White Plains, N. Y.*

25. Nespoulous, P., Personal communication to the author.
26. Box, H. K., *Studies in Periodontal Pathology.* Bulletin No. 7. Toronto: Canadian Dental Research Foundation, May 1924.
27. Orban, Balint, and Weinmann, J. P., Diffuse Atrophy of the Alveolar Bone (Periodontosis). *J. Periodont.* 13:31 (January) 1942.
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29. MacNider, W. deB., Aging of Tissues: The Necessity for Research. *Science* 104:405 (November) 1946.

A STUDY OF TOOTHBRUSHES IN USE IN AMERICAN HOMES

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For many centuries members of the human race have used implements as an aid in mouth hygiene.[1-4] Today the dental profession places considerable emphasis on the importance of the correct use of a good toothbrush. Although the extent to which dental diseases can be prevented or controlled by toothbrushing has not been determined by acceptable scientific methods, nevertheless, clinical observations have convinced dentists that toothbrushing is indispensable in mouth hygiene and in many cases is a therapeutic aid in periodontal treatment. Dental literature is replete with reports, opinions, clinical observations and case histories by prominent dentists in this country and abroad on the importance of toothbrushing in maintaining oral health.[4-25]

No reliable data are available on the number of people who use a toothbrush routinely. However, it has been shown that the sale of toothbrushes has increased steadily in this country. The War Production Board reported that 185.3 million toothbrushes, including denture brushes, were shipped from U. S. factories in 1944.[26]

In view of the importance the dental profession placed on health education and mouth hygiene practice, a study was undertaken to determine the dental health habits of the American public. The study was divided into two parts. The results of the first part are described in this paper. The second section of the study will be reported in an early issue of THE JOURNAL.

It is the purpose of this report to present data on the serviceability of toothbrushes in use by the public and on the reasons why unsatisfactory brushes need to be replaced.

The study upon which this report is based was made in cooperation with the research staff of the J. Walter Thompson Co.

Table 1.—Geographic distribution of families

Geographic area	Per cent of families
Metropolitan areas (Counties with population of 100,000 or more)	52.3
Smaller cities and towns	33.3
Farms	14.4
Total	100.0
By states	
New England	5.8
Middle Atlantic	21.7
South Atlantic	9.4
East North Central	21.3
East South Central	6.4
West North Central	12.3
West South Central	10.1
Mountain	4.1
Pacific	8.9
Total	100.0

The Survey Panel

The sampling method was used in the study. All toothbrushes in use by persons enrolled in a panel of families representing a cross section of the population were obtained by mail. The panel for the com-

plete study consisted of more than 5,500 families distributed in the forty-eight states. Representation on the panel was selected in proportion to the population and the size of the community and in relation to rural or urban residency. Families were also selected proportionately by income and age of housewife. Because of this controlled distribution the families included in the study represented a cross section of the general population. The geographic distribution of families in the panel is outlined in Table 1.

The families were divided into two groups, one of which was requested to send by mail all toothbrushes then in use by members of the family. In return they would receive new brushes. The other group was sent questionnaires dealing with dental health concepts and dental health habits. The results of the latter portion of the study will be reported in THE JOURNAL in the near future.

Table 2.—Number and condition of toothbrushes received from 1,929 families

Total brushes received	8,309	
Denture brushes	133	
Regular toothbrushes	8,176	
Average toothbrushes per family		4.2

	Number	Per cent
Brushes in satisfactory condition	1,580	19.3
Brushes in unsatisfactory condition	6,596	80.7
	8,176	100.0

Material and Methods

Every other family in the panel was asked to mail toothbrushes then in use to the Central Office of the American Dental Association. An order blank for the exact number of toothbrushes being used by the families was enclosed with the letter to the housewife which provided the means for exchanging old toothbrushes for new ones.

When the parcel post packages containing the used brushes were received

Causes for rejection of 6,596 toothbrushes	Number	Per cent of total toothbrushes	Per cent of unsatisfactory toothbrushes
For single reason	4,298	52.6	65.2
Bent or broken bristles	2,444	29.9	37.0
Matted bristles	1,435	17.6	21.8
Brush unsanitary	419	5.1	6.4
For two reasons	2,057	25.2	31.2
Bent or broken and matted bristles	1,072	13.1	16.2
Bent or broken bristles and brush unsanitary	598	7.3	9.1
Matted bristles and brush unsanitary	387	4.8	5.9
For all three reasons	241	2.9	3.6
Total brushes having bent or broken bristles	4,355	53.3	66.0
Total brushes having matted bristles	3,135	38.3	47.5
Total brushes in unsanitary condition	1,645	20.1	24.9

they were opened by the authors of this report and their assistants. The number of toothbrushes in each package was tabulated. It was assumed that the brushes were being used by members of the family immediately before they were mailed. The authors agreed that in the absence of a mechanical judging device they would examine each brush subjectively. A small number of denture brushes were received and were excluded from the study. The toothbrushes were separated into two general categories: (1) brushes in satisfactory condition, and suitable for further use and (2) brushes in an unsatisfactory condition. Toothbrushes were rejected for three reasons: (1) bent or broken bristles, (2) matted bristles, (3) unsanitary conditions.

The authors alternated in judging the toothbrushes. When a decision was not immediately obvious, the brush was examined by both investigators. In almost all cases, however, the condition of the brush was easily determined.

Findings

The results of the study are tabulated in Table 2.

It will be noted that 8,176 toothbrushes were submitted by 1,929 families, an average of 4.2 brushes per family. Since there were slightly less than four individuals per family, it might be assumed that each member of the family possessed a toothbrush. However, it was apparent that a few toothbrushes were no longer being used in the mouth but were being used for purposes other than oral hygiene.

Only 19.3 per cent of the toothbrushes were found to be in a satisfactory condition and 80.7 per cent of the brushes were in need of replacement because they could no longer be effective implements in mouth hygiene or because their use might injure dental tissues.

Bent or broken bristles were found to be the most frequent cause for rejecting the toothbrushes. Matted bristles were the second most important cause and unsanitary condition the least important. It should be pointed out, however, that 1,645 of the 6,596 unsatisfactory toothbrushes were unsanitary because of caked dentifrice and food debris at the base of the bristles. This fact suggests the need for placing more emphasis on care of the toothbrush in dental health education.

Conclusions

This study reveals the fact that four-fifths of the toothbrushes in use in a cross section of American homes are not suitable for toothbrushing and mouth hygiene. Thus, the study demonstrates conclusively the need for more frequent replacement of toothbrushes.

This study provides adequate evidence that only a small percentage of the American public follow the oral hygiene practices which the dental profession believes are important in maintaining dental health. The remedy for this situation can be found only in an aggressive campaign to inform every individual of the value of the frequent use and renewal of the toothbrush.

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9. See reference 1, page 28.

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Dental Health for School Children.—The problem of dental care is always overshadowed by the huge load of dental work that needs to be done and the usually pitifully inadequate facilities available. The present state of our knowledge indicates that good dental health requires an annual, and much better semiannual, detailed, careful dental examination and correction of any lesions found. Inspections by physicians or teachers are no substitute for this. Unquestionably every school ought to try to teach the need for semiannual examinations and to attempt to facilitate it through referral systems and arrangements with local dental societies. Just how to organize and use whatever treatment services may be available within the school system has not been answered definitely. Complete coverage of the lower grades has its advocates against those who propose a selective policy of following a limited group throughout its school career. Here, again, the need for field dental public health research is vital. A long-term study, adequately controlled, might indicate the relative value of one time or even intermittent treatment for many against that of intensive, continued treatment for the few. It seems clear, however, that since dental caries is prevalent throughout the United States the time of school dentists would be spent on filling cavities and in protecting the teeth and oral tissues of as many children as possible, instead of just searching for caries which is obviously present most of the time. —*Leona Baumgartner, Myron E. Wegman and George M. Wheatley, "Medical, Dental, and Nursing Services for School Children," J. Health & Phys. Educ. 18:651, November 1947.*

THE Journal OF THE
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LON W. MORREY, D.D.S., *Editor*

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EDITORIALS

THE EIGHTY-NINTH ANNUAL SESSION OF THE AMERICAN DENTAL ASSOCIATION

THE American Dental Association will hold its eighty-ninth annual session in Chicago from the thirteenth to the seventeenth of this month. The scientific program, consisting of the section meetings, table clinics and scientific and technical exhibits, will be held at the Stevens Hotel. The Board of Trustees, House of Delegates and most of the councils and committees will meet at the Hotel Sherman.

Judging from the agenda, members of the House of Delegates will have even less opportunity than in former years to benefit from the scientific program, as they will be kept fully occupied throughout the five day session reviewing, analyzing and disposing of committee reports and transacting other business. One of the principal matters that will occupy the attention of the House is the proposed new constitution and bylaws. The painstaking manner in which this document has been prepared by the Constitution and Bylaws Committee warrants the assumption that the instrument will be adopted, although it may be subjected to considerable discussion.

Another matter that will require much time and attention is the problem of providing sufficient dental personnel to care for the expected increase in our armed forces. The dental program of the Veterans Administration and suggestions for its improvement undoubtedly will be discussed. Other matters on which the House will be required to take action are the proposed raise in dues, the 1949 budget, the recommendation to reduce the size of the House of Delegates, the proposal to appoint a permanent Speaker of the House, the status of the National Committee of Dentists, the augmentation of the Association's legislative program and the election of officers.

This is but a partial list of the business that must be transacted by the House and which will prevent the delegates from participating in and profiting by the scientific program. Members who take little active interest in Association affairs have no concept of the sacrifice in time, money and effort made by each delegate. And the only reward received by the delegate is the knowledge that he has contributed his best to further the interests of his profession.

2nd

RESEARCH: THE KEY TO PREVENTION OF PERIODONTAL DISEASE

Most dental schools offer courses in preventive dentistry which are designed to acquaint the student with the few established technics for preventing oral disease. It is discouraging to note that these courses are usually short. In dentistry, knowledge and skills have developed largely along restorative and corrective lines, and the profession is proud of the success attained in this direction, but it must be admitted that the problem of preventing oral disease has been neglected in the past and must receive more attention in the future.

Recently, dentists interested in public health have focused attention on the fact that restorative dentistry alone will not solve the problems of improving oral health for the majority of our people. These men insist that the only hope for assuring dental health lies in the prevention of dental disease. The most prevalent of childhood dental diseases, dental caries, has been attacked from many angles and it now appears likely that practical methods of control are being developed. Certainly the studies on the reduction of caries by treatment with fluorine, ingested or topically applied; penicillin; dibasic ammonium phosphate, and vitamin K sound promising.

It should be pointed out that as methods for caries control become more effective, the problem of controlling periodontal diseases becomes more acute. Loss of teeth in adulthood usually is caused by the degeneration of tooth supporting tissues, and until methods are developed to prevent periodontal diseases, dental caries control will simply save more teeth for periodontal disease to attack. Consequently, through research, methods of preventing periodontal diseases must be found that will permit wide application. This research must not be limited to a study of new treatments and new drugs, but should include a thorough investigation of fundamental tissue reactions, as well as an evaluation of etiologic factors and methods of early diagnosis of periodontal diseases, so that rational control methods may be evolved.

Research already in progress must be expanded to develop new concepts of periodontal disease and better methods of evaluation of minor deviations from normal if we are to understand completely, as well as control, this disease. Much good work is already being done in this field. For example, a refined gnathodynamometer so delicate that even lip pressures can be measured is being developed at Tufts College Dental School by Manly and his colleagues. The development of such an instrument should help clarify our understanding of traumatic occlusion and its relation to periodontia. Certainly, careful studies of the correlation of forces of mastication to tooth position and periodontal disease are of fundamental importance.

Schour and Massler[1] are devising a method of assessing gingival disease in terms of different degrees of severity and in terms of acute and chronic gingivitis. While the value of their index is not yet established, it does open another avenue of approach to the problem of periodontal disease.

It is commendable that the scientific section of this issue of THE JOURNAL is devoted to all phases of periodontia, as this branch of dentistry deserves more emphasis than it usually receives. Only through the combined efforts of all those interested in periodontia can come a clear understanding of the problem and the development of

better methods for maintaining healthy tooth supporting tissues. The keys to the prevention of periodontal diseases must be found by research men and then used by the general practitioner if oral health is to be maintained.—*M.K.H.*

1. Schour, Isaac, and Massler, Maury, Gingival Disease in Postwar Italy (1945); I. Prevalence of Gingivitis in Various Age Groups. *J.A.D.A.* 35:475 (October 1) 1947.

SODIUM FLUORIDE PUBLICITY AND THE PRACTICING DENTIST

ARTICLES on the topical application of sodium fluoride published recently by two of the leading popular magazines[1,2] should prove gratifying to those in the profession who advocate more and better dental publicity. The authors are to be congratulated on their judgment in securing their information from recognized authorities and on their ability to translate that information into terms easily understood by the laity.

Unlike most popular expositions of scientific subjects, these articles contain little that could be censured by the most critical. Both articles have done much to focus public attention on the scientific aspect of dentistry and on the caries preventive measures which the profession now has available for children. Their publication is a perfect example of the public relation counselors' creed: "Think right, do right, then tell the public about it."

For years the profession has thought right about the value of preventive dentistry and has advocated every activity which seemed to inhibit caries, including tooth brushing, reduction of carbohydrates in the diet and the early correction of dental defects. Finally dental research workers attacked the problem on a scientific basis. Their efforts were rewarded by the discovery that sodium fluoride has merits as a caries control agent. As soon as these merits were firmly established, dentistry, with the aid of professional writers, told the public about them. The cycle of dental public relations, however, includes more than the researcher, the popular magazine and the public; it also includes every practicing dentist. In fact the general practitioner is the most important segment of the cycle.

Through the two articles mentioned and others in the public press, parents have become somewhat familiar with the topical application of sodium fluoride and are requesting more information about its use. The public relations aspect of sodium fluoride will not cease until every dentist who practices for children makes the treatment available. Even though the topical application of sodium fluoride to the teeth of children en masse can be expected to reduce the incidence of dental caries by only 40 per cent, its use is thoroughly justified. Dentists who have not used this new preventive technic should read the article by John W. Knutson published in the January 1948 issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION. Additional information on the subject may be obtained from the Council on Dental Health at the Central Office of this Association.

1. Woman's Home Companion, July 1948.
2. Saturday Evening Post, July 3, 1948.

THE NATIONAL SCENE

from the Journal's Washington Correspondent

Beginning in this issue The Journal of the American Dental Association brings you news of dentistry inside Washington and atop Capitol Hill from the typewriter of our Washington Correspondent.

Health an Issue

In what some nostalgically call "the good old days," the classical issue when national elections came around was the tariff. The hustings resounded with booming appeals for high tariffs, low tariffs and points in between. Then, in more recent years, the conduct of foreign relations became a major factor upon which candidates were accepted or rejected by the voters. This year there is a new issue which, while not ripened to the point where it is predominant, is steadily assuming an importance greater than it ever had before.

That issue is—to put it in a single word—health. Since the war's end, and particularly in the last few months, members of Congress have clearly demonstrated that they appreciate the increasing potency of medical and dental affairs as a political determinant. In their own right, dentistry and dental health have achieved a formidable importance.

An example of our point is the debate that took place on the Senate floor on the final day (August 7) of the recent Congressional session. Senators Lucas, Pepper and Murray tangled spiritedly with Senators Bridges and Knowland as to which of the two major parties should receive credit for enactment of National Dental Research Institute legislation. Republicans Bridges and Knowland proudly cited their party's leadership in establishing the new heart and dental institutes, only to be chided by their Democratic colleagues for appropriating a mere $500,000 to launch the former and no funds whatever for the dental program. Senator Murray went on to intimate that the American Dental Association and he were entitled to more credit for the dental act enactment than were the Republicans.

"Nothing has been done," said the scrappy Montanan, who defeated a physician in the primary contest for the Democratic nomination, "toward effecting that very important program which means so much to the health of the American people. Nothing can be more important than a program for the study of the causes of dental decay. It is one of the most important things in the province of medicine. It seems to me that some appropriation should have been made for that purpose."

Yes, one may be sure that with the general public's rising awareness of the blessings of dental health (accentuated by the widespread notice given sodium fluoride as a caries preventive), together with the emphasis upon national health which almost certainly will be made in campaign speeches by Truman, Dewey and Warren, the issue will be a live one, between now and November 2!

Army's Headache

As of mid-August, Army was still in a quandary as to where the dental officers are coming from when Selective Service begins enlarging the armed forces.

Meantime, Army is wondering if, and how, it is going to be able to spread its dental strength to meet minimal requirements during these next few crucial months. Undoubtedly, Secretary of Defense Forrestal and the President will ask Congress to modify the Selective Service Act so as to cover former ASTP's and V-12's who had little or no active duty. But such action can not be taken before January—barring a special session of Congress—and all signs are that Army will be in serious straits long before that. Voluminous response by civilian dentists to the Army's call for part-time work on a fee basis, plus a sudden spurt in applications for the Regular Dental Corps and active duty in the Reserve, must come about in the very near future if a truly critical situation is to be averted.

ARMY PROMISED A.D.A. AID IN SECURING

Dentists if Administrative Inequalities Are Eliminated

The Army outlined its dentist shortage problem to representatives of the American Dental Association at a meeting held in Washington, August 8 and 9, and was told that A.D.A. help would be forthcoming if present administrative inequalities in the Army dental corps are ironed out.

An impressive list of A.D.A. officials was called to Washington by the Army to work out some kind of program to aid in supplying dentists for the new draft. However, it appears that additional selective service legislation may be necessary to meet the legitimate manpower needs of the armed services.

Dr. Washburn's Statement

Dr. H. B. Washburn, A.D.A. president, told representatives of the surgeon general's office, the general staff, selective service, United States Public Health Service and the Navy, in a prepared statement, that:

1. While the acute shortage of dental personnel is recognized, it arose in part from serious past deficiencies in administration in spite of steps outlined by the Army to correct the situation. There can be no permanent correction until regulations giving the dental corps control of its own policy, personnel and supplies are installed.

2. Proposed changes in Army regulations for the dental corps are considered only a token gesture and cannot be effective unless they are supported by legislation.

3. The Association will give serious consideration to any legislation for procurement of dentists but official action must await the A.D.A.'s House of Delegates' meeting in September.

Some Conclusions

In conclusion, Dr. Washburn stated that evidence of effort to secure correction of the conditions now preventing the dental corps from rendering the most efficient service would be welcomed by the Association and he reiterated that cooperation would be provided if the A.D.A. was shown such evidence.

Army's Problem

Before Dr. Washburn read his statement the Army presented startling figures to show the acuteness of the shortage which on June 30 amounted to a deficit of about 850 dental officers on the ratio of two dentists for 1,000 enlisted men. By next June, unless procurement methods are improved, they foresee a shortage of 2,200 dental officers out of an authorized 2,800 and by 1950 they expect to be short 2,450 out of a required 3,000.

Other spokesmen for the A.D.A., Drs. Robert T. Curren, chairman of the military affairs committee and Carl O. Flagstad, chairman of the legislative committee, pointed out some of the major reasons for the unpopularity of the dental corps among dentists of World War II.

Dentists Complain

Nearly all of the complaints centered on a lack of administrative authority under existing regulations wherein the dental officer has little or no control over dental installations or service personnel. These inequalities interfere with efficient dental service, Dr. Curren said.

Dr. Flagstad recounted some of the A.D.A.'s repeated efforts to bring about changes in the regulations to put the dental corps on administrative parity with the medical corps. A record of broken promises, however, has destroyed all confidence in the effectiveness and stability of the regulations.

He said that legislation is necessary to correct the situation and that assistance of the Army would be requested in presenting such measures to Congress.

Dr. Curren additionally outlined complaints of dental officers from World War II in connection with efficiency reports, promotions, assignments and professional services.

While nothing was said openly by Army or Air Force representatives about plans for reintroduction of a special draft of professional personnel over the 26 year old age

limit, it was pointed out that present procurement methods have proved inadequate. For example, the Army said it recently conducted a nation-wide recruiting campaign for 1,500 dentists and netted 15.

Another method, that of treatment by civilian dentists on a fee basis, was pretty well ruled out by inadequate funds and the remoteness of most Army camps.

Service Representatives.—Representing the Army at the meeting were: Brig. Gen. George E. Armstrong, deputy surgeon general; Maj. Gen. Thomas L. Smith, chief of the dental division; Brig. Gen. Walter D. Love, deputy chief of the dental division; Brig. Gen. Oscar P. Snyder, dental director at the Army Medical Center; Brig. Gen. S. B. Hays, chief of the supply division, surgeon general's office; Col. James M. Epperly, dental division and a number of other staff officers. Maj. Gen. John E. Dalquist, deputy director of personnel of the general staff was present for some of the discussion and Maj. Gen. R. W. Bliss, Army surgeon general, spoke briefly.

Rear Adm. C. V. Rault, chief of the Navy dental corps attended as did Dr. Bruce Forsyth, assistant surgeon general of the U.S.P.H.S.

A.D.A. Representatives.—A.D.A. representatives, in addition to Drs. Washburn, Curren and Flagstad, were: Drs. Clyde E. Minges, president-elect; Leroy Ennis, of Philadelphia, William McGill Burns, of Brooklyn, Harold W. Oppice, of Chicago, C. K. Foster, of Cedar Rapids, Iowa and J. B. Carr, of Indianapolis, all members of the Board of Trustees; Dr. Gerald Timmons, of Philadelphia, president-elect of the American Association of Dental Schools; Dr. Henry Swanson, of Washington, D. C., president of the American Association of Dental Examiners; A.D.A. staff members present were: Drs. Harold Hillenbrand, general secretary, Lon W. Morrey, editor of the JOURNAL, L. M. Cruttenden and C. Willard Camalier, assistant secretaries and Mr. Herbert Bain, director of the bureau of public information.

N.S.R.B. Names Dr. Phillips

Appointment of Dr. Percy T. Phillips, secretary of the first district dental society of the Dental Society of the State of New York, to the top-level medical advisory committee of the National Security Resources Board was announced recently in Washington, D. C., by Arthur M. Hill, chairman of the Board.

The committee which will consult with the Board on health matters as they affect the nation's security, has six members and was to meet with the Board's medical services division.

Other members are: Drs. William P. Shepard, San Francisco; A. C. Bachmeyer, Chicago; James C. Sargent, Milwaukee; Edward L. Bortz, Philadelphia and Michael E. DeBakey, New Orleans.

Dr. Phillips also is chairman of the American Dental Association's constitution and bylaws committee.

Dr. Burns Named to O.V.R.

Dr. William McGill Burns, of Brooklyn, N. Y., has been appointed to the professional advisory committee of the Office of Vocational Rehabilitation, according to Dr. Thomas B. McKneely, chief medical officer.

Dr. Burns' first meeting with the committee was held in Chicago late in June and it was apparent, he said, that the dental problem in vocational rehabilitation previously had received little attention at either the Federal or State level.

The number of clients receiving dental treatment has tripled in the last three years, Dr. Burns told THE JOURNAL after the meeting. About half the service was for dentures during the current year, he said.

The committee generally agreed that the dental service program needs considerable study and outlining of objectives and regulations in the coming year.

CONVENTION PROCEDURES TO BE SPEEDED:

89th Meeting to Have More Than 200 Clinics

A new note in the activities of the 89th annual meeting of the American Dental Association, September 13-15, at Chicago, will be the introduction of voting machines.

Designed to cut down on wasted time when the House of Delegates meets, the voting machines will be used for all elections and the polls will be open from 8 a.m. to 1:30 p.m., Thursday, September 16, for balloting on new officers.

Present plans call for nominating speeches on Wednesday in the House and announcement of victorious officers sometime Thursday afternoon. If all goes according to plan, a new record for election tabulations should be set.

More than 200 clinics are listed in the program for the meeting with some 125 research authorities, practitioners, teachers and other scientists scheduled to participate in an additional eleven scientific sections all of which will be held at the Stevens Hotel except the section on hospital dental service. That section will be held in the oral surgery amphitheater of the University of Illinois college of dentistry.

Invited speakers will be Surgeon General Leonard A. Scheele, of the United States Public Health Service and Dean Gerald D. Timmons, of Temple University school of dentistry, Philadelphia.

Attendance May Be High

Present reservations indicate an attendance of from 12,000 to 15,000 of which 8,000 to 10,000 are expected to be out-of-town visitors. (Reservation blanks are available in all recent issues of THE JOURNAL.)

A number of allied and associated groups not included in the official membership of the A.D.A. will meet either in conjunction with or immediately preceding the convention.

The A.D.A.'s Board of Trustees and various committees are scheduled to meet during the week preceding the convention to iron out final details and hold annual business meetings.

State Conference.—An annual conference of State Society Officers will be held Sunday, September 12, at the Sherman Hotel. The House of Delegates also will convene in the Sherman. This program will open with a panel on revised constitution and bylaws, and will be followed by another morning discussion on whether the numerical size of the house of delegates of the A.D.A. should be reduced? The afternoon will be devoted to talks by officers and officials of the A.D.A. with an hour given to an open discussion of how the A.D.A. office could be of greater service to state societies.

The Stevens Hotel will be the scene of 54 scientific exhibits, approximately 250 commercial exhibits and a series of motion picture showings.

Among the exhibits will be a Navy trailer. This exhibit is part of a reserve dental officer recruiting program. The unit is from Great Lakes naval training center.

Legislation.—Additional emphasis has been placed on an open forum meeting to be held Sunday, September 12, at the Stevens Hotel by the Committee on Legislation. Dr. Carl O. Flagstad, chairman of the committee, has said that the following subjects will be discussed: old age and survivors insurance to all self employed; the status of defense legislation and its effect on the dental profession; legislation for the dental corps and the Veterans Administration; state legislation and licensure

of technicians. He adds that most state legislatures will convene in 1949 and that a discussion of state measures now is timely.

Associated Groups

Other groups meeting before the A.D.A. convention starts are: American Academy of Periodontology, Hotel Sheraton, September 9-11; American Association of Dental Examiners, Hotel Sherman, September 11-12; American College of Dentists, Hotel Sherman, September 12; American Full Denture Society, Congress Hotel, September 11-12; American Society of Dentistry for Children, Stevens Hotel, September 11-12; American Society of Oral Surgeons, Stevens Hotel, September 9-11 and the International College of Dentists, Stevens Hotel, September 12.

The American College of Dentists will commemorate the 1948 centennial celebration of the American Association for the Advancement of Science being held in Washington, D. C., September 13 to 17, with a special program September 12, at the convention.

The A.D.A. and the International Association for Dental Research have been invited to participate in the program.

The Association of American Women Dentists will meet at the Blackstone Hotel, September 13.

Social Events.—Social functions at the convention will include: Past presidents of the American Dental Association luncheon, Hotel Sherman, September 14; testimonial luncheon for Harry B. Pinney, former A.D.A. general secretary, Hotel Sherman, September 14; dinner dance and entertainment honoring President and Mrs. H. B. Washburn, Stevens Hotel, September 15.

The A.D.A. central office will hold an open house for members, their wives and guests from 2 to 5 p.m. daily from September 13 through 16. Tea will be served in the Board Room from 3 to 5 p.m. and Mrs. Josephine P. Hunt, associate librarian, will serve.

States reporting delegates after the preliminary program was printed are:

Hawaii

Delegates:
Dwight H. Uyeno, 201 Bishop Bank Bldg., King and Smith Sts., Honolulu
Masao Kubo, P. O. Box 1166, Hilo
Alternates:
Sau Yee Chang, Lihue, Kauai
John Harry Dawe, 810 North Vineyard St., Honolulu

Idaho

Delegate:
Fred Whitsell, Emmett
Alternate:
William E. Baggs, Buhl

Nevada

Delegate:
George Steinmiller, Box 2473, Reno
Alternate:
Stephen W. Comish, Elko

Puerto Rico

Delegate:
Miguel A. Pastrana, Rio Piedras

Utah

Delegates:
Sanford Ballinger, Tribune-Telegram Bldg., Salt Lake City
Preston L. Jones, Nephi
William S. Moyes, 407 First Security Bank Bldg., Ogden
Alternates:
Frank Rees, Coalville
Victor H. Sears, Tribune Building, Salt Lake City
R. C. Dalgleish, State Capitol Bldg., Salt Lake City

Wyoming

Delegates:
T. A. Ward, Casper
O. R. Docekal, Sheridan

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Dental Health Day

Plans for the first annual nation-wide observance of National Children's Dental Health Day were advanced recently when the American Dental Association's council on dental health informed constituent and component dental societies what they can do to help get a program under way.

Points mentioned in the letter are:

1. Lectures, demonstrations and table clinics on dentistry for children for members of the dental profession.
2. Educational programs and exhibits for the public.
3. Newspaper and radio publicity.
4. Poster and Essay contests.
5. Mayor's and Governor's proclamations.

DENTISTRY IN ACTION

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Last survivor of the battleship "Maine," Adm. Wat Tyler Culverius, pauses during a talk before the Massachusetts State Dental Society. Listening at his left is Dr. James H. Maycock, society president and native of Worcester, Mass.

●

Dental education was advanced recently when Dean Wendell D. Postle, of the College of Dentistry, Ohio State University, at Columbus, broke ground for a new dental building. Here he tells the student body and faculty what the occasion means.

INTEREST IN NEW DRAFT RUNNING HIGH:

26 to 45 Year Old Group May Be Called

While correspondence indicates that interest in the coming military draft is running high on the state dental society level, activity in Washington has bogged down following adjournment of the special session of Congress.

The feeling is prevalent that the draft provision dropped from the selective service bill passed just before the close of the 80th Congress will be reintroduced in January. (Elsewhere in the News of Dentistry Section of this JOURNAL is a report on a meeting of A.D.A. officers and members of the military, held at Washington, August 8 and 9.)

Like Congressmen, however, members of dental societies around the nation were anxious to drop affairs of state during the month of August.

Pacific Meeting A highlight in recent days was the Pacific Coast Dental Conference held at Salt Lake City. An airplane mishap and a trek through the desert on foot lent an adventurous note to the meeting when Dr. and Mrs. Boyd Jenkins, of Ocean Lake, Ore. made a forced landing in the desert near the convention site.

Dentists from eight western states and two Canadian provinces joined in the meeting which featured papers by some 15 essayists. They were: Drs. Edward Ball, Cincinnati; Don Bellinger, Detroit; A. H. Schmidt, Lincoln, Neb.; Ralph L. Ireland, Lincoln, Neb.; Floyde E. Hogeboom, Los Angeles; James Nuckolls and Dickinson G. Bell, San Francisco; H. L. Harris, Denver; Scott M. Smith, Salt Lake City; Frank Reese, Coalville, Utah; Douglas Pincock, Ogden, Utah; Lloyd Jacobson, New Westminster, B.C.; Howard T. Gilbert, Seattle; Harold E. Nelson, Midvale, Utah and Francis C. Montgomery, Heber City, Utah.

Dr. Harold Hillenbrand, general secretary of the American Dental Association, also attended the sessions.

South Is Active A number of southern state dental societies and associations are lending their efforts to promote attendance at the New Orleans Dental Conference to be held Oct. 24-27. Eighteen limited attendance clinics are scheduled with a day devoted to golf and registration. A series of commercial, scientific and health exhibits will be open throughout the meeting.

The clinics are on the following subjects: clinical procedures in amalgam restorations; immediate full dentures; exodontia for the general practitioner; variable gingival injuries; hydrocolloid impression technic for inlays and bridges, and diagnosis and treatment planning.

Oklahoma.—Mr. H. Leon Snow, of Oklahoma City, recently replaced Mr. Richard H. Tunnicliff as executive secretary of the Oklahoma State Dental Association. Following the death of Dr. E. W. Wise, president-elect, Dr. R. M. Dunn, of Tulsa, was appointed to the office.

Tennessee.—Legislation was passed at the last meeting of the Tennessee State Dental Association authorizing employment of a full-time executive secretary, according to Dr. Arthur R. Sample, chairman of the committee appointed to carry out the plan.

Dr. Sample also urged any member of the American Dental Association who knows of a qualified person who might fill the position to contact him at 800 Medical Arts Building, Memphis 3, Tenn.

A Half Century.—And among those who reached the 50 years-in-practice mark recently was Dr. W. O. Talbot, Ft. Worth, Tex. He was graduated from Northwestern University Dental School in 1899 with a specialty in periodontia. The Fort Worth District Dental Society honored him in a special ceremony held on a country estate near the city.

State Plan Lauded In the north, the Minnesota State Dental Association's program to raise $30,000 to $50,000 for dental research through a subscription campaign, has been let in for some favorable comment in the Minneapolis press.

Renewed activity along the research line gave the Minneapolis Morning Tribune ammunition for an editorial which stated in part that the program "is certain to leave the public greatly in debt." The editorial also said more than $30,000 already had been pledged toward the fund.

The St. Paul Pioneer Press carried their editorial two days before the Tribune and it said in part: "In this campaign, Minnesota's dentists are demonstrating to the public their interest in further improving the level of dental health."

Both editorials made particular reference to progress already made in dental research and in the studies of fluoride application in control of caries.

St. Louis.—The St. Louis Dental Society's midcontinent dental congress will be held November 21-24 in St. Louis, according to a report from James E. Brophy, executive secretary. Leo M. Shanley, of 7800 Maryland Ave., Clayton, Mo., is chairman.

Wisconsin.—The Rock County Dental Society of Wisconsin has elected the following new officers: Dr. R. M. Thompson, president; Dr. D. R. Saecker, vice-president and Dr. A. M. Potts, secretary-treasurer. Following the society's business meeting a clinic was given on silicates by Dr. Harvey Uebele, president-elect of the Wisconsin State Dental Society.

Seminar.—The fifth annual seminar of medical dentistry, to be held at Desert Inn, Palm Springs, Calif., is scheduled for October 17-22 and Dr. Hermann Becks, professor of dental medicine at the University of California, has been selected president of the meeting.

Among the highlights of the seminar will be meals prepared from recipes prescribed by Dr. Michael Walsh, designed to demonstrate the palatability of foods prepared without sugars, molasses or honey.

DENTAL SCHOOL APPLICATIONS ARE SOARING:

Television Breaks Into Dental Education

As the nation's dental schools get set to open their doors for the 1948-49 academic year, indications are that even more than last year's record 10,000 applicants who filed credentials will be clamoring for admission. The schools again are faced with turning many away.

In retrospect, activity around the admissions offices this summer has been intense, aided perhaps by generally favorable weather during most of July and August.

At one place on the map television moved out of the bistros long enough to apply itself to the task of showing 500 persons at Creighton University, in Omaha, Neb., how to treat periodontal disease.

Dr. Lawrence Donohoe, professor of periodontoclasia at Creighton, demonstrated a treatment involving the use of zinc chloride pack and curettage as taught at the university, before the televison cameras of radio station WOW which was transmitted on a closed circuit to the students watching a battery of five receiving sets in the school auditorium. Dr. Donohoe gave a running commentary on the operation and employed charts to explain oral anatomy and the nature of the disease.

Televised Dentistry

The program was managed by students attending the third annual summer school in radio.

The event, believed to be the first dental operation ever televised, exhibited some of the possible applications of this flexible medium in dental education .

Expansion Continues Indiana University school of dentistry, Bloomington, continued its expansion of dental education facilities in admitting 90 students to the fall freshman class, Dean Maynard K. Hine said last month. The beginners were chosen from several hundred applicants and the class represents an increase of 40 per cent over the 1947 class and 100 per cent over I. U. dental classes since 1925. Dean Hine added that many of the students admitted this year had three and four years of college training although admission is based on 60 hours of credit.

Dentists Aided Aware of the need for additional training for practicing dentists, several of the nation's dental schools recently joined the institutions presenting postgraduate courses this fall. A complete list of graduate, postgraduate and refresher courses for the 1948-49 year is being compiled by the American Dental Association's Council on Dental Education.

In an effort to increase the postgraduate training in the Army dental corps, Brig. Gen. Walter D. Love, of the Surgeon General's office, said recently that 18 dental schools across the nation are instituting a naval reserve officers training program for dental students. The training program, largely military for the first two years and clinical for upperclassmen, will be under supervision of a regular Army dental officer who will be taking some postgraduate dental instruction at the school. The University of Illinois already has announced installation of the voluntary system.

Illinois.—A postgraduate course of six lectures designed to present recent advances in cancer of the oral cavity will be offered again by the University of Illinois college of dentistry in cooperation with the Illinois division of the American Cancer Society, Illinois State Dental Society and the Illinois State Medical Society.

The course will begin the evening of October 6 with Dr. Bernard G. Sarnat, head of the department of oral and maxillofacial surgery, in charge. Sessions will be held on six consecutive Wednesdays from 7:30 to 9:30 p.m. and arrangements to transmit the lectures by telephone to dentists and physicians in outlying areas are being made.

The tuition charge has been waived through the courtesy of the Illinois division of the American Cancer Society. For further information and registration write Dr. Isaac Schour, associate dean in charge of postgraduate studies of the college of dentistry, 808 South Wood St., Chicago 12, or call him at Monroe 3900, extension 491.

The university also announced a two-year, full-time graduate course in the basic sciences, with limited clinical experience which will give credit toward a master of science degree and will begin in September.

Kansas City.—The school of dentistry, University of Kansas City, Mo., also introduced an intensive course in the Universal Appliance to be conducted from November 1-13. Construction of the appliance, basic sciences and orthodontic fundamentals will be taught by demonstration and lecture. For further information write Dean R. J. Rinehart, school of dentistry, University of Kansas City, 10th and Troost, Kansas City 10, Mo.

New York.—The following refresher and postgraduate dental courses will be offered in the coming school year by the college of dentistry, New York University: anatomy; ceramics; children's dentistry; crown and bridge; dental jurisprudence; complete dentures; inhalation anesthesia; operative dentistry; oral surgery; orthodontia; partial dentures; pathology; periodontia; practice management; precision attachments; pulp canal therapy and roentgenology. The postgraduate division opens September 7 and intermittent and continuous courses varying in length from a day to 37 weeks will be given. For additional information write the division, New York University college of dentistry, 209 East 23rd St., New York 10.

Ohio State.—The Postgraduate Division of Ohio State University college of dentistry, directed by Dr. Hamilton B. G. Robinson, announces several five-day courses will be given in the autumn term. They are: anatomy of head and neck, Dr. Edwards, Sept. 20-24; partial dentures, Dr. Steffel, Sept. 27-Oct. 1;

x-ray, Dr. Spangenberg, Oct. 11-15; oral pathology, Dr. Robinson, Oct. 18-22; full dentures, Dr. Boucher, Oct. 25-29; periodontia, Dr. Wilson, Nov. 1-5; endodontia, Dr. Kaiser, Nov. 29-Dec. 3 and oral surgery, Dr. Snyder, Dec. 6-10.

In addition, the following courses will be given in the spring term: crown and bridge; children's dentistry; dental caries control; operative dentistry and oral hygiene for dental hygienists. For further information write the Postgraduate Division of the college of dentistry, Ohio State University, Columbus 10.

Caries Control Advanced

A three point program to aid the dentist in answering patient's requests for control of caries has been announced coincident with establishment of a caries control laboratory by the University of Pennsylvania dental school.

The laboratory, to go into operation about October 1, is designed to: (1) examine saliva specimens for lactobacilli and make recommendations for controlling dental decay when these organisms are present in large numbers; (2) to distribute information on methods for controlling dental decay and (3) for research. Applications for service by the laboratory must be on forms which will be provided by the university. On receipt of the forms the patient will be sent two saliva containers and test specimens will be taken according to normal methods. The charge will be $10 for as many saliva analyses for lactobacilli as are necessary in a one-year period.

Student Draft

Selective Service tentatively has accepted a means of deferring dental and pre-dental students from the coming draft by allowing the dental school deans to certify students. However, final authority on deferment rests with the local draft board as was the case in World War II.

Pre-dental students, following completion of a year of college study, will be eligible for certification, according to Dean Gerald D. Timmons, of Temple University dental school and member of a Selective Service committee on education. Students in the dental school also will be eligible.

A plan proposed by Selective Service allows for three years of pre-professional study during which time deferred students will be in a pool from which professional students may be drawn.

Quotas outlined for dentistry in the plan call for certification of 55 per cent of the 1949 pre-professional class, 62.5 per cent in 1950 and 100 per cent in 1951. This sliding scale is based on the assumption that the need for deferment will increase as World War II veterans complete their training.

Professional students, however, have been given no numerical quota and all those doing satisfactory work may be certified by the dental school deans.

Dean Timmons also stated that the majority of selectees will be drawn from the lower age group in the 19-25 draft. It is estimated that only about 230,000 men will be obtained from some 4,800,000 registrants in the upper four-year age group. The lower age group probably will be tapped early in 1949, he said.

An inventory of students enrolled or to be enrolled in the nation's dental and pre-dental schools is being undertaken and deans of all recognized dental schools are to meet at 2 p.m., September 11, in the Rose Room of the Sherman Hotel, in Chicago, to hear Col. Richard Eanes, medical director for Selective Service, preliminary to the annual meeting of the American Dental Association, September 13-17.

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Essay Contest

The American Association of Orthodontists has announced a $500 prize essay contest to run until March, 1949.

The contest is open to any member of the Association and any affiliate of a recognized institution in the field of dentistry such as a teacher, researcher, undergraduate or graduate student.

According to the rules, each essay must represent an original investigation and contain some new and significant material of value to orthodontia. The cash prize of $500 is offered for the winning essay with honorable mention provided for second and third places. The first three papers will be presented before the meeting of the association to be held in New York, May 2-6, 1949. For further information write Dr. Allan G. Brodie, chairman of the research committee, American Association of Orthodontists, 30 North Michigan Ave., Chicago 2.

A.S.T.P.'s, V-12's NOT SUBJECT TO RECALL:

Dr. East Appointment Confirmed by V.A.

A ruling by the military's legal brains that the Army and Navy do not have any strings on A.S.T.P. and V-12 dentists discharged from service without having seen active duty eliminated the possibility that those veterans would be called back to care for members of the new draft Army. Now indications are that some revision in the existing selective service act will be made by the 81st Congress which convenes after the first of the year. (A story on the critical dentist shortage in the armed forces appears elsewhere in this issue of THE JOURNAL.)

Dr. East Appointed Appointment of Dr. Bion R. East, associate dean of the faculty of medicine at Columbia University and executive officer of the University's department of dental and oral surgery, New York, as assistant medical director in charge of dental service of the Veterans Administration and a statement by Dr. East's predecessor, Dr. E. M. Kennedy, to the effect that V.A. dental clinic activity would not be expanded, also highlighted action on the veterans news front last month.

Dr. East, 1908 graduate of the University of Michigan's school of dentistry and life member of the Michigan State Dental Society, also was a professor of dentistry and has served as chairman of the University's committee on dental education. He practiced three years in Colorado and returned to Detroit where he was in private practice until World War I. He was with the A.E.F. in France during 1918 and 1919.

From 1919 to 1921 he served as V.A. consultant in Michigan, later entering research at Delmar Institute of Public Health at Columbia in 1938.

Dental Clinics Dr. Kennedy who was acting assistant V.A. medical director for dental service before Dr. East's appointment told Dr. H. B. Washburn, president of the American Dental Association, in a letter that no further expansion of V.A. dental clinics is planned.

He additionally reported that several of the smaller clinics around the country have been closed and that 90 per cent of all V.A. dental work is being done by practicing dentists on the fee basis. He said that fee dentists could make requests for treatment in addition to that prescribed by examining V.A. dentists.

Dentists Resign Other V.A. developments included the resignation of Drs. Gerald D. Timmons and J. Ben Robinson as dental consultants to the administration. They are deans of Temple University school of dentistry and Baltimore college of dentistry respectively.

ARMY AND NAVY

Increased efforts to establish administrative parity for the Army dental corps on a level with the medical corps through legislative change were made in Washington recently when representatives of the American Dental Association met with the military to discuss the shortage of dentists in the armed forces. (A complete report on the A.D.A.-armed forces conference, held August 8-9, is in this issue of THE JOURNAL.)

Navy Activities Naval dental officers in the Washington, D.C. area recently honored Rear Adm. Alexander Gordon Lyle at a dinner given at the Army and Navy Club. He had completed 33 years in the Navy.

A scroll commemorating the Admiral's service was presented by Commodore George C. Paffenbarger, of the dental reserve corps, and American Dental Association fellow at the National Bureau of Standards.

Adm. Lyle long has been active in dental circles and distinguished himself in combat in World War I. He was awarded the Congressional Medal of Honor. He also received the Silver Star and Cluster and an Italian decoration as well as becoming the first naval dental officer to be made a rear admiral.

Col. Snyder Promoted

Army dental corps developments involved the promotion of Col. Oscar P. Snyder to the rank of brigadier general and his assignment to the Army Medical Center, Washington, D.C., as director of the dental division. He received his promotion while serving as chief of dental service, Fitzsimmons General Hospital, Denver.

Gen. O. P. Snyder

Gen. Snyder is an alumnus of Ohio State University, class of 1916, and he entered the Army dental corps in November of that year. He served on the Mexican border, later joining the 28th (Pennsylvania) Division as dental surgeon during World War I. In World War II he served in the Pacific as director of dental service in that theater for 34 months. In 1945 he became chief of dental service at England General Hospital, Atlantic City. He is a member of the American Dental Association, fellow of the American College of Dentists, member of Xi Psi Phi and Omicron Kappa Upsilon fraternities.

GENERAL NEWS

Reorganize Health Dept.

Immediate reorganization of New York's Health Department to provide more effective top level management is under consideration by Mayor O'Dwyer.

Earlier recommendations for the proposed reorganization were made by Commissioner Harry S. Mustard and are included in the recent report to the Mayor made by his Executive Committee on Administration.

According to the plan made public recently, five units, each with its own administrative head, will be set up and dentistry will fall in a group with maternal and child health.

The reorganization has been made necessary by the speedy growth of the department, the report states, while pointing out that 4,000 persons are on the staff, and some $16,000,000 is being spent annually.

Children's Fund

Of the $269,876.15 spent by the Children's Fund of Michigan for child health from May 1, 1947 to April 30, 1948, the organization's dental program took $105,555.57, according to the annual report prepared by William J. Norton, executive vice-president of the fund.

Organized 19 years ago with a $10,000,000 grant from the late James Couzens, United States senator from Michigan, and later enlarged to $12,000,000, the Fund was obliged to spend the entire sum in 25 years at a rate of not less than $700,000 annually.

The county dental program undertaken last year served 21,693 children and the dental and orthodontia clinic at Children's Hospital of Michigan, in Detroit, served another 3,609.

Dental Sales.—Subjects connected with dental supply management were presented to members of the Dental Dealers of America and several persons from the Dental Manufacturers of America at a summer conference held early in July by Ohio State University.

Hygienist Retires

The retirement of Helen M. Baukin as director of Dental Health Education of Hawaii recalls twenty-six years of pioneering which brought dental care to children in every elementary school in the Islands.

A native of Wisconsin, Miss Baukin journeyed to Hawaii in May 1921 to serve as dental hygienist on the staff of the Honolulu Dental Infirmary, now Strong-Carter Dental Clinic at Palama Settlement. A short time later a dental hygiene program was authorized for Hawaii's public schools and she undertook formation of the first such plan with the help of nine field hygienists.

H. M. Baukin

Today there are 32 hygienists covering all Territorial public schools and twelve private schools with expansion of the service pending availability of additional workers.

INTERNATIONAL CORRESPONDENCE

News from Argentina

Two New Hospitals

In the near future two big hospitals are to be built as part of the National Government's so-called Five Year Plan, which also includes many other imposing public works. One is to be erected in the heart of the city of Buenos Aires, on the site now occupied by the headquarters of the capital's sanitary administration, and will cost approximately 21,000,000 pesos. The other is to be raised on the outskirts of Rosario (Argentina's second city), on the extensive grounds of the country club, which will be expropriated for that purpose.

Jointly these two polyclinics will attend to the medical needs of from 3,000 to 4,000 inpatients. They also will have outpatient departments for the different medical and dental specialties.

Fees

The continual rise in the cost of living has compelled several dental societies in this country to consider an increase of professional fees. Consequently, some groups have urged their associates to demand higher compensation for their services, thereby conforming to the requirements of the present economic situation. —*David M. Cohen, Casilla de Correo 2047, Buenos Aires, Argentina.*

News From Great Britain

Unofficial estimates now place the number of British and Welsh dentists serving under the National Health Act system at about 6,500 and the trend toward more complete nationalization of the dental and medical professions is growing.

Figures released July 24 by the Ministry of Health placed 6,224 of the nation's 10,000 dentists in the government service and 1,062 of some 1,400 practitioners in Scotland in a similar system on that island.

The dentists appear to be signing up for the national service largely in the industrial areas of Northern England while those in the residential and agricultural South remain skeptical. Those dentists already in the service are making a strong effort to get the program of "free" treatment for some 27,500,000 Britains underway in an orderly fashion.

Attempts to generalize on the attitudes of British dentists are complicated, however, by the fact that there are such cases as exist in two British seaside towns in the south where 100 per cent of the dentists are signed up for the service while only about forty miles away, the dentists have refused to a man.

In talking with several dentists in the vicinity of Newcastle Upon Tyne, it was learned that the paper work which at first seemed formidable, is being dealt with quickly. Patient's dental treatment forms which must be filled out and sent to the Regional office of the Ministry of Health for approval are being returned in from six to seven days. The dentists are hiring additional clerical and mechanical help and one dentist processed 167 forms in three weeks.

An important consideration in the trend toward more dentists entering the service despite some admonition from the British Dental Association lies in the scale of fees. They are better even than those listed in the Spens Report which was at least partially acceptable to the dentists. One dentist states that he can do better mechanical work under the government scale than he could under his own fee.

So far about 20 per cent of the patients in the north have refused government sponsored care, but the general skepticism attendant to the confusion which followed inauguration of the service July 5, is deteriorating. Faster return of the patient's request for dental treatment and enlistment of prominent citizens in many communities probably are the reasons.

The new scale of fees follows: (Translated at the rate of 4/2 to $1.00.)

Clinical examination and report 10/- ($2.50)
Scaling and gum treatment 16/6 ($4.10)
Fillings
Amalgam, one surface £1/0/- ($5.00)
Amalgam, more than one surface £1/10/- ($7.50)
Silicates £1/5/- ($6.25)
Deciduous teeth, per tooth 10/6 ($2.60)
Root treatment
Single rooted non septic £2/-/- ($10.00)
Multi rooted and all septic teeth £3/-/- ($15.00)
Extractions
1 or 2 teeth 10/- ($2.50)
Rising scale to 20 teeth or over £2/7- ($9.80)
General anaesthetic
1 to 3 teeth 10/- ($2.50)
Rising scale to 20 teeth or over £2/-/- ($10.00)
Dentures
Full upper and full lower £10/10/- ($52.50)
Partial 1, 2, 3 teeth £4/17/6 ($24.30)
4 to 8 teeth £5/15/- ($25.75)
9 to 14 teeth £6/1/6 ($30.30)
Apicectomy, per tooth including root treatment £4 to £5 ($20 to $25)
Gingivectomy fee within the range £1/17/6 to £15/-/- ($9.30 to $75.00)
Radiological examination
Intra-oral films, first film 10/- ($2.50)
Each additional film 7/6 up to a maximum of £3 ($15.00)
Extra-oral films, each film £1/1/- ($5.25)
to maximum of £5/5/- ($26.25)
Cysts, roots, impacted teeth £7/15/- ($38.75)
Fee per case of arrested bleeding £1/-/- ($5.00)
Gold dentures £8/17/6 to £18/5/- ($44.35 to $91.25
Gold filling £2/-/- to £5/10/- ($10.00 to $27.50)
Inlays
One surface £4/2/6 to £5/-/- ($20.65 to $25.00)
Two surface £5/7/- to £6/10/- ($26.75 to $32.50)
Three surface £5/17/6 to £7/2/6 ($29.35 to $35.65)
Crowns
Shell £4/7/6 ($21.85)
Post £5/15/- ($28.75)
Jacket £7/10/- to £9/7/6 ($37.50 to $46.85)

—*John R. Boyes, Newcastle Upon Tyne, England.*

REPORTS OF

COUNCILS AND COMMITTEES

COMMITTEE ON HOSPITAL DENTAL SERVICE

STANDARDS FOR APPROVAL OF HOSPITAL DEPARTMENTS OF DENTISTRY

Since dental care is a necessary part of the treatment of many medical and surgical conditions of hospitalized patients, cooperation between medicine and dentistry is imperative in modern hospital organizations.

Many new hospitals throughout the United States have been completed or are under construction. Plans for many new institutions are under consideration, and many old established hospitals are expanding to meet the increasing demands for hospitalization. Most of these plans provide for space for an adequate dental department or an expansion of the dental service already established, in order to meet the American Dental Association's standards for certification of hospital dental departments.

All hospitals should rapidly evolve departments of dentistry with adequate facilities so that they may assume the responsibility of more complete dental service for patients in the wards and in the outpatient clinics.

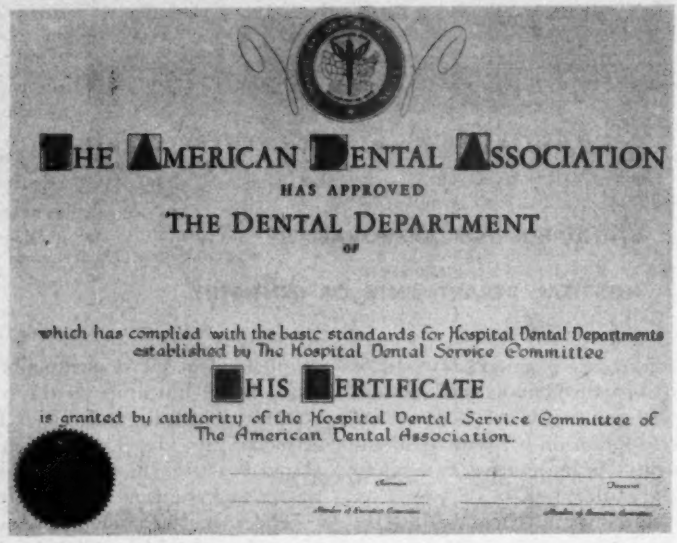
Hospital personnel interested in certification for their department of dentistry should consider the basic standards set up by the Committee on Hospital Dental Service and adopted by the House of Delegates of the American Dental Association. These standards, known as *Basic Standards of Hospital Dental Service Required of Approved Hospitals* have been approved as a recommendation for departments of dentistry in all hospitals by the following committees of the American Hospital Association: The Council on Professional Practice, the Coordinating Committee and the Board of Trustees.

The American Dental Association Committee on Hospital Dental Service consists of twenty-two members plus an equal number of consultants conveniently located so that hospitals in all states may be examined for certification with minimal travel expense. It was recommended that state societies appoint hospital dental service committees, and many have done so. On a few occasions, members of the state committees have served as examiners for hospital dental departments in their states.

The basic standards provide for six sections in the department of dentistry, and recommend that each hospital establish as many of these sections as are necessary to provide an adequate dental service in the particular hospital. The recommended sections are:

1. Dentistry for Children
2. Restorative Dentistry
3. Periodontics
4. Dental Roentgenology
5. Oral Surgery
6. Oral Pathology

Some of the cardinal requirements for certification are as follows:


THE AMERICAN DENTAL ASSOCIATION
HAS APPROVED
THE DENTAL DEPARTMENT
OF
which has complied with the basic standards for Hospital Dental Departments established by The Hospital Dental Service Committee
THIS CERTIFICATE
is granted by authority of the Hospital Dental Service Committee of The American Dental Association.

1. The title of the department responsible for the hospital dental service should be "The Department of Dentistry" or some similar title containing the word dentistry or dental, consistent with those used for divisions of service within the given hospital.

2. The department of dentistry should have autonomy and be organized under the direction of a dentist.

3. Patients hospitalized primarily for the treatment of oral conditions should be admitted in the name of a dentist and on the dental service.

4. The space allotted to the department of dentistry and the equipment, instruments and supplies of the department should be adequate for such services as may be carried out in accordance with generally accepted standards of practice.

5. The dental staff should be sufficient in number and qualification to maintain an adequate dental service and train junior staff members.

Up to June 1, 1948, the following hospitals had been notified that their dental departments had met the requirements of the basic standards as set up by the Committee on Hospital Dental Service, and would receive certificates of approval.

Connecticut

Norwich State Hospital, Norwich.
The Hartford Hospital, Inc., Hartford.

Illinois

University of Chicago Clinics, Chicago.
The Carle Foundation and Carle Memorial Hospital, Urbana-Champaign.

Indiana

The Indianapolis General Hospital, Indianapolis.

Massachusetts

The Children's Hospital, Boston.
The Boston City Hospital, Boston.
Massachusetts General Hospital, Boston.
Worcester City Hospital, Worcester.

New Jersey

Jersey City Medical Center, Jersey City.

New York

The Bronx Hospital, New York.
Harlem Hospital, New York.
Jewish Sanitarium and Hospital for Chronic Diseases, Brooklyn.

New York Polyclinic Medical School and Hospital, New York.
New York Medical College, Flower and Fifth Avenue Hospitals, New York.
Roswell Park Memorial Institute, Buffalo.
Metropolitan Hospital, New York.

North Carolina

North Carolina Baptist Hospital, Winston-Salem.

Ohio

Cleveland State Hospital, Cleveland.

Pennsylvania

Children's Hospital of Pittsburgh, Pittsburgh.
The Western Pennsylvania Hospital, Pittsburgh.
Elizabeth Steel Magee Hospital, Pittsburgh.
The George F. Geisinger Memorial Hospital, Danville.
Guthrie Clinic, Sayre.
The Jewish Hospital Association of Philadelphia, Philadelphia.
Western State Psychiatric Institute and Clinic, Pittsburgh.
St. Francis Hospital, Pittsburgh.
The Presbyterian Hospital, Pittsburgh.
Pennsylvania Hospital, Philadelphia.

U. S. Army Hospitals

Percy Jones General Hospital, Battle Creek, Mich.
Letterman General Hospital, San Francisco.
Walter Reed General Hospital, Washington, D. C.
Fitzsimons General Hospital, Denver.

U. S. Navy Hospitals

U. S. Naval Hospital, Philadelphia.
U. S. Naval Hospital, Newport, R. I.
U. S. Naval Hospital, Annapolis, Md.
U. S. Naval Hospital, St. Albans, Long Island, N. Y.
U. S. Naval Hospital, Guam, M. I.

An application blank and copy of the *Basic Standards of Hospital Dental Service Required of Approved Hospitals* may be obtained by writing to the secretary of the Committee, J. Frank Hall, D.D.S., Indiana University School of Dentistry, Indianapolis 2.—*W. Harry Archer, Chairman; J. Frank Hall, Secretary; H. B. G. Robinson, and Frank J. Houghton, Executive Committee.*

RESEARCH COMMISSION

INFORMATION AVAILABLE ON RESINOUS FILLING MATERIALS

From time to time the Research Commission has received inquiries relating to the probability of a self-hardening resin that could be used as a plastic filling material in dentistry. Such a resin, if it had the proper characteristics, would displace silicate cement as a filling material.

The Executive Board of the Research Commission is not familiar with any American development of this kind that has proceeded far enough to be considered satisfactory. However, there was developed in Germany a resin known as Palapont S. H. which was used as a direct resinous filling material. The best information available on this material is Fiat Final Report No. 1185, *Recent German Developments in the Field of Dental Resins.* A copy may be obtained for 50c from the publisher, the Department of Commerce, Washington, D. C.

FEDERAL OLD AGE AND SURVIVORS' INSURANCE; PROPOSED AMENDMENTS TO THE PRESENT LAW

THERE were introduced into the Eightieth Congress several bills which proposed to amend the social security laws pertaining to old age and survivors' insurance in order to cover the self-employed, which would include dentists. Although the bills did not progress very far in the Eightieth Congress, indications are that similar bills will be given serious consideration and are likely to be enacted in the next Congress. At the request of the Senate Committee on Finance, the Advisory Council on Social Security has made an extensive study of the advisability of expanding the old age and survivors' program and has published a report.

The Committee on Legislation will hold an open forum meeting for the discussion of the proposed amendments in order to determine the attitude of Association members toward this type of legislation. The meeting will be held in the Grey Room of the Sherman Hotel from 10:00 a.m. to 12:30 on Sunday, September 12, 1948 and members of the Association are cordially invited to attend.

The following analysis of the present federal old age and survivors' law and of the proposed amendments was prepared for your information by Thomas J. McDermott, Cleveland, vice-chairman of the Committee on Legislation. *—Carl O. Flagstad, Chairman.*

Coverage

Federal old age and survivors' insurance as administered by the Federal Security Agency of the Social Security Administration was inaugurated on January 1, 1937. At present this system operates only for wage and salary earners in private industry and commerce, for their families and for the survivors of certain World War II veterans.

Not covered by this law are, in general, jobs in agriculture; domestic service in private homes; federal, state or local government service, and work in religious, charitable, and certain other nonprofit organizations.

Dentists generally are not included, because they come under the group of self-employed, which is not covered by the program.

The worker's contribution or tax at present is 1 per cent of the wages he receives in covered employment up to $3,000 a year.

The employer's contribution or tax is 1 per cent of the wages he pays each employee up to $3,000 a year.

Retirement Insurance

The benefits under the provisions of retirement insurance are payable when the worker has attained the age of 65 and is not earning more than $14.99 a month on a job covered by the Social Security Act.

When the worker retires at 65 or later, his wife may receive monthly benefits until the worker dies, provided that the worker is receiving retirement benefits and that the wife is 65 years of age or more, is living with the worker or being supported by him, and is not earning more than $14.99 a month on a job covered by the Social Security Act.

When the worker retires at 65 or later, each of his children may receive monthly benefits until he or she becomes 18, provided that the worker is receiving retirement benefits and that the child is unmarried, is not earning more than $14.99 a month on a job covered by the Social Security Act, and is dependent on the worker.

Under the present law a worker earning an average of $250 a month with five years' coverage would receive a primary benefit of $42 a month on retirement; with 10 years' coverage his primary benefit would be $44; with 20 years' coverage, $48; with 30 years' coverage, $52; with 40 years' coverage, $56.

Under the present law, the benefits which the worker will receive at the age of 65 is computed by this formula:

1. Take 40 per cent of the first $50 of the worker's average monthly wage while he was covered by the Social Security Act.
2. Add 10 per cent of the remainder of the worker's average monthly wage up to $200.
3. Add 1 per cent of the total of 1. and 2. for each year the worker was paid $200 or more in jobs covered by the Social Security Act.

For instance, if the worker's average monthly wage was $120 and he has worked in covered employment for nine years, his retirement or primary benefits would be figured as follows:

40% of the first $50	=	$20.00
10% of the remaining $70	=	7.00
		$27.00
9% of $27 for 9 years' coverage (1% per year)	=	2.43
Total		$29.43

Thus $29.43 represents the worker's monthly retirement or primary benefits.

In addition to this, the wife receives half of the primary benefit each month after she becomes 65. Each child who is unmarried and under 18 receives half of the primary benefit.

Survivors' Insurance

Under the provisions of survivors' insurance, the widow who has children eligible for benefits receives three-fourths of the primary benefit and each child who is less than 18 and unmarried receives half of the primary benefit.

The widow who has no child eligible for benefits will receive three-fourths of the primary benefit monthly when the widow attains the age of 65. Each eligible dependent parent of the deceased worker will receive monthly one-half of the primary benefit when the parent reaches the age of 65.

When the worker dies at any age, his parents may receive monthly benefits provided that he died fully insured and left no widow or child who might ever be eligible for survivors' benefits, and that his parent is 65 or more, was supported chiefly by the worker, and is not earning more than $14.99 a month on a job covered by the Social Security Act.

Examples.—Under the present law, on the death of a worker who received an average monthly wage of $250 for 5 years, his widow would receive a monthly benefit payment of $31.50; with 10 years' coverage she would receive $33; with 20 years' coverage, $36; with 30 years' coverage, $39, and with 40 years' coverage, $42.

Limits.—The minimum monthly benefit is $10. The maximum monthly benefit is whichever of the following is least: (1) twice the primary benefit; (2) 80 per cent of the worker's average monthly wage; (3) $85.

Currently Insured.—A worker is currently insured if he has worked on cov-

ered jobs approximately half the time during the three years preceding his death.

Fully Insured.—The worker is fully insured if he has worked on covered jobs at least half of the time between January 1, 1937 and the time he retires or dies. A worker cannot be fully insured with less than six quarters of coverage. A worker is fully insured for life if he has earned forty quarters of coverage.

Quarters of Coverage.—A quarter of coverage is a three month period in which a worker has been paid $50 or more a month on a job covered by the Social Security Act.

Proposed Amendments

The following recommendations appear in a report made by the Advisory Council on Social Security to the Senate Committee on Finance.

1. The Self-employed.—Self-employed persons, such as business and professional people, farmers and others who work on their own account, should be brought under coverage of the old age and survivors' insurance system. Their contribution should be payable on their net income from self-employment, and the contribution rate should be one and one-half times the rate payable by the employee.

2. Maximum Base.—The upper limit on earnings subject to contributions and credited for benefits should be raised from $3,000 to $4,200. The maximum average monthly wage used in the calculation of benefits should be increased from $250 to $350.

3. Benefit Formula.—The primary insurance benefit should be 50 per cent of the first $75 of the average monthly wage plus 15 per cent of the remainder up to $275.

4. Increased Survivor Protection.—Survivor benefits for a family should be at the rate of three-fourths of the primary insurance benefit for one child and one-half for each additional child, rather than one-half for all children as at present.

5. Maximum Benefits.—The maximum benefit amount payable on the wage record of an insured individual should be three times the primary insurance benefit amount, or 80 per cent of the individual's average monthly wage, whichever is less, except that this limitation should not operate to reduce the total family benefits below $40 a month.

6. Minimum Benefits.—The minimum insurance benefit payable should be raised to $20.

7. Retirement Test.—No retirement test should be imposed on persons aged 70 or more. At lower ages benefits should be suspended for any month in which the earnings exceed $35 but each quarter the beneficiary should receive the amount by which the suspended benefits exceeded such earnings.

8. Contribution Schedule.—The contribution rate should be increased to one and one-half per cent for employees and one and one-half per cent for employers.

9. Qualifying Age.—Under the present program, 65 is the qualifying age for all aged beneficiaries—wives, widows, dependent parents and retired workers. The Advisory Council recommends that the age requirements for members be reduced to 60 years.

10. Primary Benefit.—Under proposed amendments, the primary benefit for an average wage of $350 a month after 10, 20, 30 or 40 years' coverage would be $78.75 monthly.

DEATHS

Pollock, Joseph W., Marshall, Va.; Dental Department, George Washington University, 1905; died February 27.

Potter, William S., Detroit; Chicago College of Dental Surgery, Dental Department of Loyola University, 1901; died June 4; aged 71.

Rawlins, Charles W., Boston; Harvard University Dental School, 1914; died May 6; aged 58.

Reininger, Frederick A., Stamford, Conn.; died June 30; aged 64.

Richan, James A., Rockland, Maine; Harvard University Dental School, 1898; died May 27; aged 75.

Robbins, William S., Palestine, Ill.; Central College of Dentistry, 1904; died March 17; aged 70.

Schade, Robert F., Cudahy, Wis.; Dental School, Marquette University, 1918; died May 15; aged 54.

Searl, Charles L., Chicago; Northwestern University Dental School, 1906; died May 5.

Sheehy, Frank, San Francisco; died March 13, aged 53.

Silcott, James, Cincinnati, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1886; died March 22; aged 86.

Skinner, William H., Washington, D. C.; College of Dentistry, Howard University, 1923; died in May; aged 52.

Sleeper, George, Worcester, Mass.; Boston Dental College, 1895; died May 8; aged 76.

Smallwood, Manuel I., Washington, D. C.; died May 15; aged 42.

Smith, David B., Chicago; died April 4.

Snider, C. G., Hamilton, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1913; died January 11.

Soltman, David J., Philadelphia; Pennsylvania College of Dental Surgery, 1906; died May 17.

Spooner, Harry A., Oskaloosa, Iowa; College of Dentistry, Drake University, 1912; died April 15; aged 57.

Stagmer, E. Bronson, Oaklyn, N. J.; School of Dentistry, Temple University, 1925; died June 11; aged 45.

Stewart, Wallace B., Indiana, Pa.; Medico-Chirurgical College of Philadelphia, 1902; died May 30; aged 73.

Tanner, F. J., Texarkana, Ark.; Atlanta-Southern Dental College, 1921; died February 25; aged 57.

Taylor, Dan B., Buffalo; died April 5; aged 48.

Temples, J. M., Joplin, Mo.; died March 11.

Thomas, Harry B., Horse Cave, Ky.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1900; died March 11; aged 76.

Thomas, William R., Alexandria, Ind.; Indiana Dental College, 1901; died April 20.

Thornburg, Waldo E., Redkey, Ind.; Indiana Dental College, 1912; died April 27.

Thweatt, G. E., Rich Hill, Mo.; Baltimore College of Dental Surgery, 1894; died April 25; aged 81.

Turek, Lada J., Cleveland; Western Reserve University, 1919; died February 28; aged 52.

Turner, William J., Upper Montclair, N. J.; School of Dentistry, University of Pennsylvania, 1887; died April 8; aged 84.

Ulrich, Lewis, Addison, Mich.; College of Dental Surgery, University of Michigan, 1919; died June 6; aged 53.

Umbenhaur, Ellery V., Chicago; College of Dentistry, University of Illinois, 1914; died March 21; aged 68.

Walker, Harry A., Ashley, Ill.; died March 14; aged 75.

Wanklyn, George F., Frankfort, Kans.; Kansas City-Western Dental College, 1921; died February 4; aged 60.

Wedell, Harold G., Chicago; Northwestern University Dental School, 1918; died June 20; aged 51.

Whaling, Bernard N., North Wildwood, N. J.; Pennsylvania College of Dental Surgery, 1903; died March 4; aged 82.

Williams, Benjamin F., Philadelphia; Pennsylvania College of Dental Surgery, 1879; died March 24; aged 90.

Willson, Kenneth S., Chicago; Northwestern University Dental School, 1923; died in March; aged 51.

Wilson, Clark E., Erie, Pa.; School of Dentistry, University of Pittsburgh, 1933; died February 4; aged 39.

Wise, Eugene W., Tulsa, Okla.; School of Dentistry, Vanderbilt University, 1923; died June 1; aged 50.

Wyckoff, John R., Stony Brook, N. Y.; New York College of Dentistry, 1898; died May 12; aged 76.

Young, Frederick, W., Detroit; Department of Dental Surgery, Detroit College of Medicine, 1895; died March 6; aged 81.

Zimmer, C. J., Lexington, Ky.; Cincinnati College of Dental Surgery, 1916; died May 12, aged 62.

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ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	May 2-4, 1949	Biloxi	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			B. K. Litt	68 E. Congress, Tucson
Arkansas			D. M. Hamm	Clarksville
California			L. E. Linehan	450 Sutter St., San Francisco
S. California	April 4-6, 1949	Los Angeles	M. E. Ralston	903 Crenshaw Bldg. Los Angeles 6
Colorado			R. A. Downs	724 Republic Bldg., Denver 2
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			G. Zurkow	301 Medical Arts Bldg., Wilmington 9
D. of Columbia			K. H. Wood	202-1835 Eye St., N. W., Washington
Florida	Dec. 12-15	Hollywood	J. I. Todd	433 St. James Bldg., Jacksonville
Georgia	Oct. 11-13	Augusta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	Oct. 28-31	Lihue	J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho			R. Sutcliff	Twin Falls
Illinois	May 9-12, 1949	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 16-18, 1949	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 2-4, 1949	Des Moines	H. I. Wilson	417 Higley Bldg., Cedar Rapids
Kansas			F. A. Richmond	1008 Huron Bldg., Kansas City
Kentucky	April 4-7, 1949	Louisville	A. B. Coxwell	1976 Douglas Blvd., Louisville
Louisiana	June 1-4, 1949	New Orleans	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine			P. W. Anderson	32 Deering St., Portland 3
Maryland			E. L. Passagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 2-5, 1949	Boston	P. E. Adams	227 Commonwealth Ave. Boston 16
Michigan	April 11-13, 1949	Detroit	F. Wertheimer	Michigan Department of Health, Lansing
Minnesota	Feb. 21-23, 1949	Minneapolis	C. V. E. Cassel	Lowry Medical Arts Bldg., St. Paul
Mississippi			F. C. Sneed	Osyka
Missouri			C. W. Digges	Exchange National Bank Bldg., Columbia
Montana	May 5-7, 1949	Bozeman	C. S. Renouard	305 Phoenix Bldg., Butte
Nebraska	May 9-11, 1949	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	June 3-4, 1949	Reno	L. G. Jacob	505 Chestnut St., Reno
New Hampshire			F. E. Williams	814 Elm St., Manchester
New Jersey	April 27-29, 1949	Atlantic City	J. G. Carr	407 Copper St., Camden
New Mexico			J. S. Eilar	First National Bank Bldg. Albuquerque
New York	May 10-13, 1949	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 19-21, 1949	Pinehurst	R. F. Hunt	Rocky Mount
North Dakota	May 8-11, 1949	Bismarck	A. L. Smeby	Northwood
Ohio	Nov. 7-10	Columbus	E. G. Jones	185 E. State St., Columbus
Oklahoma	April 10-13, 1949	Oklahoma City	F. H. Binkley	Hennessey
Oregon	Feb. 28-Mar. 2, 1949	Portland	W. H. Hurley	Selling Bldg., Portland 5
Panama Canal Zone			R. O. Leon	Box 1094, Ancon
Pennsylvania			E. R. Aston	421 Market St., Kingston
Puerto Rico			E. Capo	9 Villa St., Ponce
Rhode Island			A. A. Albert	84 Broad St., Pawtucket
South Carolina			J. R. Owings	201 E. North St., Greenville
South Dakota			E. W. Elmen	Sioux Falls
Tennessee	May 16-19, 1949	Knoxville	E. J. Justis	Exchange Bldg., Memphis
Texas	May 2-5, 1949	Houston	W. Ogle	313 Medical Arts Bldg., Dallas
Utah			S. Ballinger	1001 Tribune-Telegram Bldg., Salt Lake City
Vermont	May 22-24, 1949	Woodstock	J. A. Larrow	Middlebury
Virginia	April 11-13, 1949	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke
Washington			F. J. Dingler	1502 Medical & Dental Bldg., Seattle 1
West Virginia	May 16-18, 1949	Wheeling	C. J. Gavelda	Clarksburg
Wisconsin	April 19-21, 1949	Milwaukee	K. F. Crane	1233 Bankers Bldg., Milwaukee 2
Wyoming			J. D. McNiff	208 Grand Ave., Laramie

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Arizona	Oct. 6-9		R. K. Trueblood	24 N. Second Ave., Glendale
D. of Columbia	Jan. 10-14, 1949	Washington	D. S. Thorn	1726 Eye St., N. W., Washington
Indiana	Nov. 8-11	Indianapolis	Carl A. Frech	504 Broadway, Gary
Iowa	Oct. 11-15	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Ohio	Oct. 4-9	Columbus	E. D. Lowry	79 E. State St., Columbus
Texas	Oct. 11-15	Dallas	R. T. Weber	312 Capital Nat'l Bank Bldg. Austin

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
Alumni Association of the University of Buffalo, School of Dentistry, Forty-Sixth Annual Meeting	Oct. 12-14	Buffalo	R. L. Montgomery Chm. Press and Publications	675 Delaware Ave., Buffalo
American Academy of Periodontology	Sept. 9-11	Chicago	C. E. Chamberlain Secy.	Jefferson Bldg., Peoria
American Academy of Plastic Research in Dentistry	Sept. 11	Chicago	L. Kraus Secy.	411 E. Mason St., Milwaukee
American Academy of Restorative Dentistry, Annual Meeting	Sept. 11-12	Chicago	K. A. Bignell Secy.	25 E. Washington St., Chicago 2
American Association for the Advancement of Science, Centennial Celebration	Sept. 13-17	Washington	H. Shapley Chm. Policy Comm.	1515 Massachusetts Ave. Washington 5
American Association of Dental Editors	Sept. 11	Chicago	G. R. Spalding Secy.	555 W. Maple Ave., Birmingham, Mich.
American Association of Dental Examiners Annual Meeting	Sept. 11-12	Chicago	R. P. Thomas Secy.	720 Francis Bldg. Louisville
American Association of Public Health Dentists, Annual Meeting	Sept. 11-12	Chicago	C. L. Sebelius Secy.	Tennessee Dept. of Health, Nashville
American Board of Oral Surgery	Sept. 7-8*	Chicago	L. M. FitzGerald Secy.	718 Roshek Bldg., Dubuque
American College of Dentists	Sept. 12	Chicago	O. W. Brandhorst Secy.	4952 Maryland Ave., St. Louis
American Dental Assistants Association	Sept. 13-16*	Chicago	Mary L. Martin	610 Jefferson Ave. LaPorte, Ind.
American Dental Association, Eighty-Ninth Annual Meeting	Sept. 13-17	Chicago	H. Hillenbrand Secy.	222 E. Superior St., Chicago 11
American Dental Hygienists' Association Twenty-Fifth Annual Meeting	Sept. 13-17	Chicago	A. Rebekah Fisk Secy.	1704 N. Troy St., Arlington, Va.
American Dental Laboratories Association, First Annual Convention	Sept. 23-26	Washington	H. A. Herensperger Chm. Program Comm.	1930 Chestnut St. Philadelphia 3
American Denture Society	Sept. 11-12	Chicago	H. L. Harris Secy.	1325 E. 16th Ave., Denver 6
American Public Health Association Seventy-Sixth Annual Meeting	Nov. 8-12	Boston	R. M. Atwater Secy.	1790 Broadway, New York, 19

Name	Date	City	Secy. or Chm.	Address
American Society for the Advancement of General Anesthesia in Dentistry, Fall Meeting	Oct. 25	New York	N. H. Feldman Exec. Secy.	730 Fifth Ave., New York
American Society of Dentistry for Children, Annual Meeting	Sept. 11-13	Chicago	E. L. Lampshire Secy.	708 Sharp Bldg., Lincoln 8
American Society of Oral Surgeons, Thirtieth Annual Meeting	Sept. 9-11	Chicago	H. Bear Secy.	1112 E. Clay St., Richmond 19, Va.
Association of American Women Dentists, Annual Meeting	Sept. 13	Chicago	Josephine E. Vander Wolff Secy.	25 E. Washington St., Chicago
Central Section of the American Association of Orthodontists	Oct. 25-26	Lincoln, Nebr.	E. E. Shepard Secy.	4500 Olive St., St. Louis, Mo.
Chicago Club of Women Dentists	Sept. 12-14	Chicago	Beulah Seamans Pres.	25 E. Washington St., Chicago
Conference of State Society Officers	Sept. 12	Chicago	H. K. Willits Pres.	750 N. Tenth St., Reading, Pa.
Detroit District Dental Society Seventh Annual Dental Review	Nov. 3-4	Detroit	L. A. Katzin Gen'l Chm.	4421 Woodward Ave., Detroit 1
Federacao Odontologica Brasileiro, Fourth Congresso	July, 1949	Recife, Brazil	R. Ewerton	277 Avenida Rio Branco, Rio de Janeiro
Fifth Annual Seminar for the Study and Practice of Dental Medicine	Oct. 17-21	Palm Springs	M. G. Lewis Exec. Secy.	1618 Ninth Ave., San Francisco 22
Greater New York Dental Meeting, Twenty-Fourth Annual Meeting	Dec. 6-10	New York	Mabel Purdy Secy.	Rm. 106A, Hotel Pennsylvania, New York 1
Greater Philadelphia Annual Meeting	Feb. 2-4, 1949	Philadelphia	R. Adams Secy.	501 Stock Exchange Bldg., Philadelphia 2
Mid-Continent Dental Congress, St. Louis Dental Society, Eighth Annual Meeting	Nov. 21-24	St. Louis	L. M. Shanley Chm.	7800 Maryland Ave., Clayton
Montreal Dental Club, Twenty-Fourth Annual Fall Clinic	Oct. 27-29	Montreal	M. L. Donigan Director	Drummond Medical Bldg., Montreal 25
National Board of Dental Examiners	Dec. 6-7†		G. L. Teall Secy.	Box 71, Hiawatha, Kan.
New England Dental Society, Annual Meeting	Oct. 27-28	Boston	J. F. Barton Secy.	43 Farmington Ave., Hartford 5
New Orleans Dental Association, New Orleans Dental Conference	Oct. 24-27	New Orleans	L. J. Shoeny Chm. Pub. Relations	Maison Blanche Bldg., New Orleans
Northeastern Society of Orthodontists	Nov. 21-22	New York	O. Jacobson Secy.	35 West 81st St., New York
Odontological Society of Western Pennsylvania, Annual Meeting	Oct. 26-28	Pittsburgh	W. E. Craig Secy.	Jenkins Bldg., Pittsburgh 22
Trade Union of Hungarian Physicians, Annual Meeting of the Section of Stomatology	Sept. 4-12	Budapest, Hungary	J. Kende Secy.	Nador-U, 32, Budapest, V.
Twenty-Third Journees Dentaries de Paris	Nov. 24-28	Paris	Robert DuPont Secy.	29 Boulevard Malesherbes, Paris 8

*Examinations for certification.

†Examinations will be held in schools where there are five or more candidates.